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ELECTRICAL WORLD

APRIL 26, 1930
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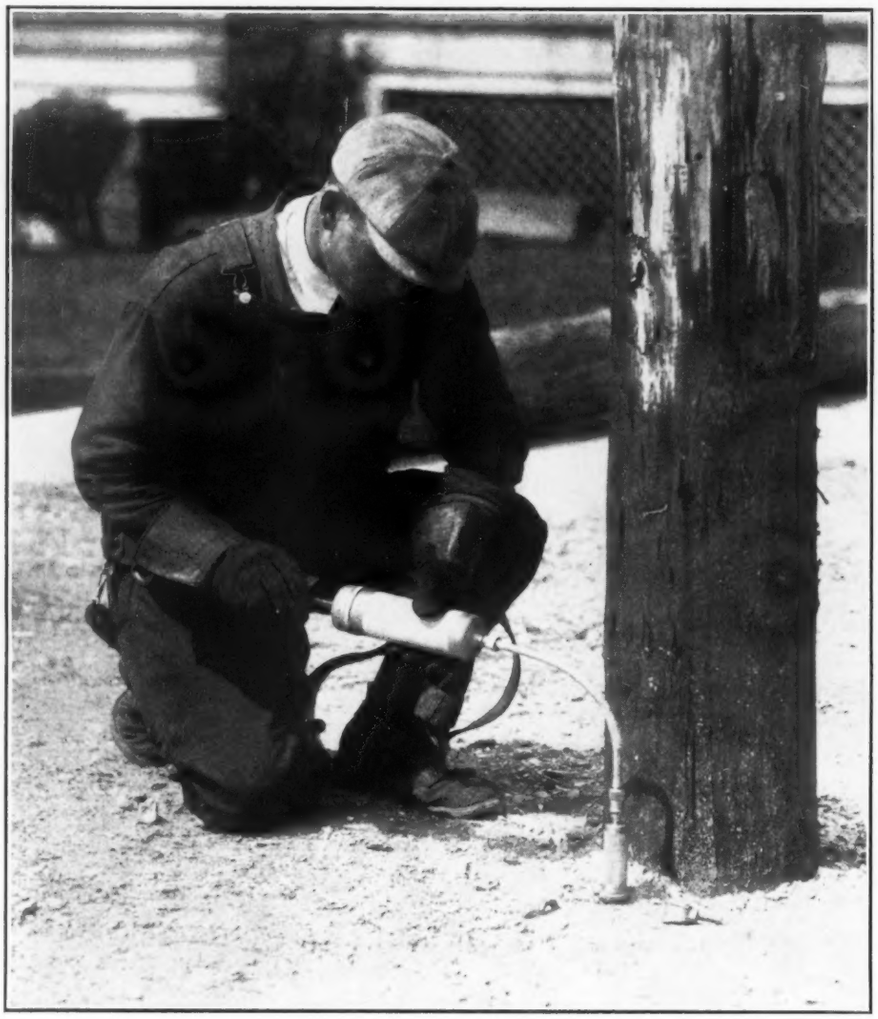

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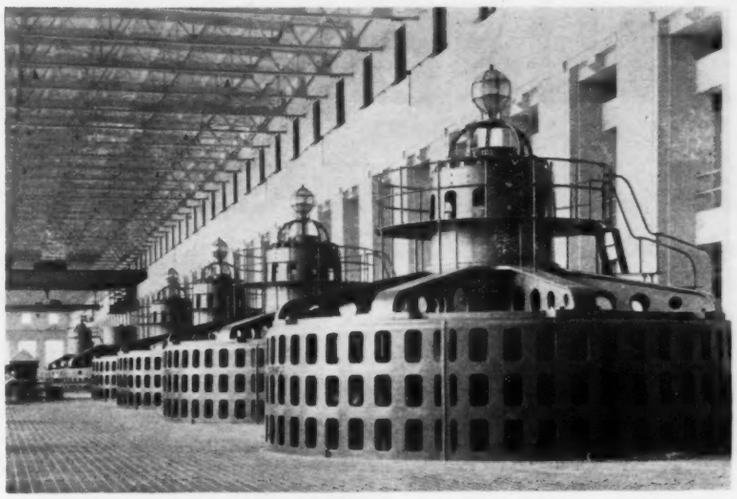

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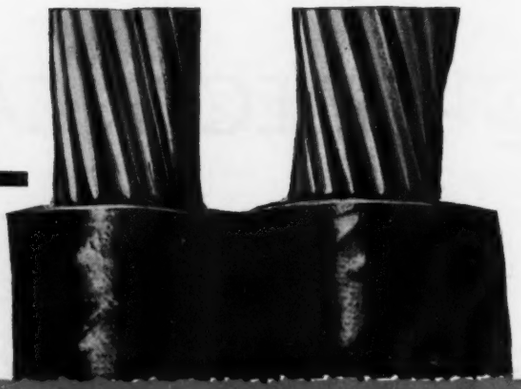

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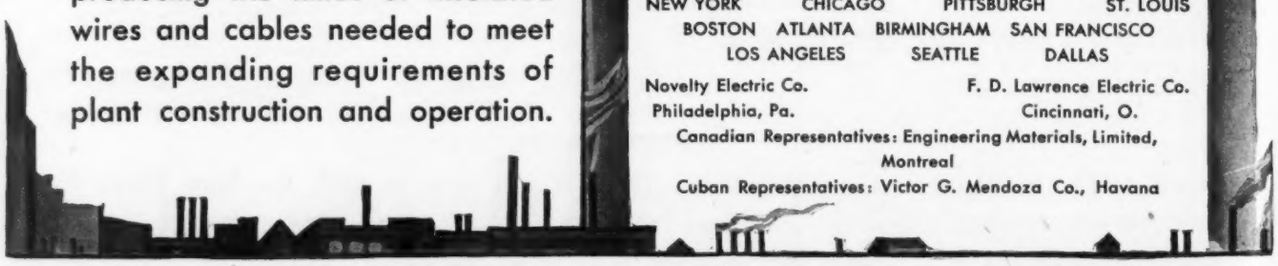

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ELECTRICAL WORLD

for the Week Ending

April 26, 1930

Utility Earnings Up 12 per Cent

Bond & Share Paid 2½ Cents for Stock?

Advisory Research for Westinghouse

Roosevelt Vetoes People's Counsel Bill

—NO PEOPLE'S COUNSEL for Governor Roosevelt of New York, who looks askance at the work of the public service investigating commission. Vetoes for most of the 39 bills are foreseen as Legislature approves nearly all.

"IT WILL BE only a few years before Canada ranks ahead of all the world in the amount of power she produces and the uses to which it is put," says R. O. Sweezey, president of the Beauharnois Power Corporation, after considering the characteristics of her natural power resources.

COPPER at 12 cents is the expectation of many buyers. Poor business and five months' surplus stock is creating the price-cutting pressure.

UTILITY EARNINGS increased 12 per cent in February, 1930, as against those for February, 1929. Energy output for the corresponding period increased only 3 per cent.

—AMERICAN CAPITAL continues to invade foreign fields. Insull interests form a Canadian investment corporation and a Greek holding company has been organized by other American interests.

—ENGINEERING may also be "largely a matter of geography." Practices upon which one group of designers have agreed in fundamentals have refreshingly different aspects when overseas ways are viewed. Structures for British grid scheme are examples.

—MASSACHUSETTS claims utility capitalization has been inflated by recent purchases of utility properties by holding companies.

—FEDERAL TRADE COMMISSION investigators testify that Electric Bond & Share made 67 per cent net profit from all income received since 1907.

—ADD 25 FT. to the height of Boulder Dam, is the verdict of Colorado commission of engineers. Flood control is basis on which recommendation was made.

NEWS OF THE WEEK

Electric Bond & Share Dissected at Federal Trade Hearings

SECOND of America's large electric utility organizations to be subjected to the exuberant inquiry of the Federal Trade Commission under Senatorial resolution, Electric Bond & Share Company was variously accused and pilloried by witnesses for the federal body during the past week. The same features of eager search for skeletons which might be rattled and soiled linen in possible need of vast airings characterized the hearings as were encountered in the American Gas & Electric Company investigation by the commission. As before, the matter is largely one of viewpoint, policy and definitions.

Return of 3,102 per cent alleged on stock of underlying company

John H. Bickley, accountant and utility expert for the commission, testified Wednesday that Bond & Share received in 1927 a dividend of $148,800 on the stock of the Southeastern Power & Light Company, which had cost it only $4,795, a return of 3,102 per cent on investment. A return in 1928 of 2,191 per cent on its investment of stock of the National Power & Light Company and of 200 per cent on Electric Power & Light stock was charged.

Bond & Share made a profit in 1927 of at least 241 per cent of the cost of the three principal types of services it renders for companies affiliated with it, Mr. Bickley testified.

Underlying stocks cost as little as 2½ cents a share, accountant testifies

A. R. Colbert, accountant who had examined records of the company for the commission, presented the testimony on the cost of the stocks. He explained acquisitions of stock by Bond & Share in connection with organization of new companies, in which there was no payment by Bond & Share for the stock.

In the case of the Southeastern Power & Light Company the cost of the common stock was 2½ cents a share, he said.

Mr. Colbert alleged Bond & Share to have acquired as bonuses for services 55.6 per cent of its holdings of American Power & Light Company stock, 98.7 per cent of its holdings in Electric Power & Light Corporation, 36.8 per cent of its holdings in National Power & Light Company, and 17.9 per cent of its holdings in Lehigh Power Securities Corporation.

Of stock of the American Gas & Electric Company held by Bond & Share, 71.2 per cent was acquired without direct cost, Mr. Colbert alleged.

Bond & Share sold the stock of the Utah Securities Corporation to Electric Power & Light Corporation, when the latter company was organized, for $10 a share and 224,772 shares of stock of the newly organized company. The cost of the shares of the new company to Bond & Share was about 25 cents a share, it was charged.

Common stock of the National Power & Light Company was acquired in similar transactions in such a way as to cost Bond & Share $1.26 a share, Mr. Colbert said.

Write-up of nearly 400 millions in value of American & Foreign Power is charged

A "write-up" of $399,201,827 in the valuation of the securities on the books of the Electric Bond & Share Company was made in March, 1929, the Federal Trade Commission was told by Samuel Meisels, engineer and accountant for the commission. The "write-up" was entirely in value of stock of the American & Foreign Power Company held by Bond & Share and took place at the time of the taking over by Bond & Share of the Electric Bond & Share Securities Corporation.

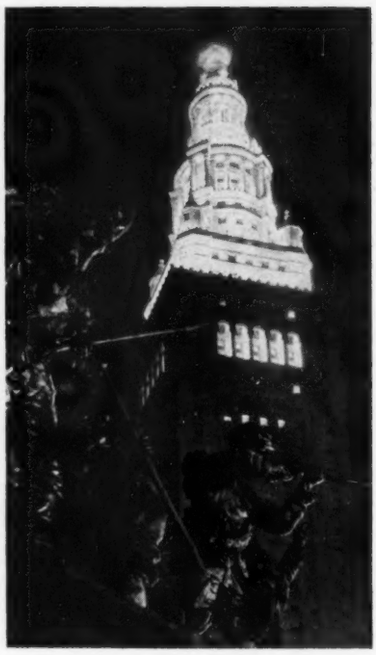
Robert E. Healy, counsel for the commission, read from an exhibit presented in the investigation stating that this increase in book value of the stock was based on a reappraisal of the securities by the company.

The shares were carried on the books of the old Electric Bond & Share Company, which was reorganized when it took over the Electric Bond & Share Securities Corporation, at a value of about $94,064,000, Mr. Meisels testified. On the books of the new company they were carried at $493,265,954.

To balance the books of the company, the surplus was written up $382,062,000, from $117,938,000 to $500,000,000; reserve was increased $4,701,112, from $298,888 to $5,000,000; common stock was increased $11,053,060, from $85,100,000 to $96,153,060; and the remainder of the changes necessary were shown in the current account, Mr. Meisels said.

The book value of stock of domestic corporations held by Bond & Share on December 31, 1927, was $23,320,000, according to A. R. Colbert. Of this, $3,009,500 was preferred stock and $20,310,000 was common. The common

CLEVELAND'S TOWER



Gigantic shadows cast by the figures on the soldiers and sailors' monument in Cleveland's Public Square give a unique and striking appearance to this picture of the Union Terminal Tower, lighted from the thirty-seventh floor to the top by 251 G.E. projectors.

stock, Mr. Colbert said, cost the company $9,161,000, leaving a difference of $11,149,000 between the cost and the ledger value. Of this, he said, $7,974,000 constituted a write-up, the remainder being accounted for by stock dividends and bonuses that were received by the company.

Supervision and service fees yield 105 per cent profit

In computing the profit from fees for services, Judson C. Dickerman, commission accountant, said that the fees received from the companies which it supervises were $9,373,000 in 1927. Total operating expenses for that year were $6,613,000, and of these expenses there were $2,050,000 which definitely could not be allocated to the cost of the supervision and services, leaving $4,563,000 which might be allocated to cost of the services.

Subtracting the last figure from the total fees received, he said, there would be left a profit of $4,810,000 or 105 per cent of the cost of the services.

W. B. Horne, another accountant for the commission, presented a volume of charts and tables of intercorporate relations of the companies of the group, which was introduced into the record. The charts and tables showed extensive office holding in the supervised companies by officers of the Bond & Share Company.

Mr. Horne testified that prior to 1925 the General Electric Company held nearly all the common stock of Bond & Share and that at the end of 1924 it was transferred to Electric Bond & Share Securities Corporation. The stock, he said, was voted by General Electric and the Securities Corporation, their votes being always a majority.

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N.E.L.A. Offers Data on Industry Attacks

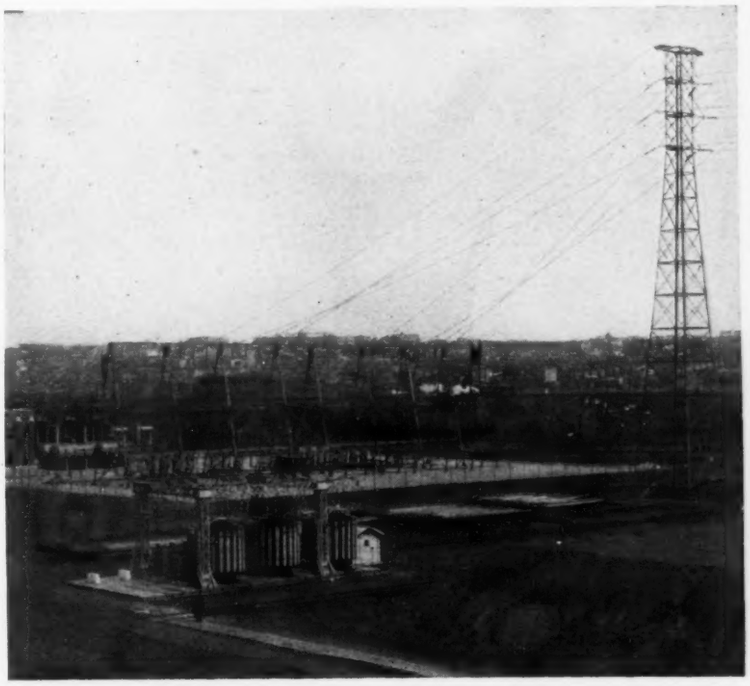
"THE Radical Campaign Against American Industry," a book containing a brief and exhibits which were offered as evidence but refused by the Federal Trade Commission in its investigation of public utilities, has been issued by the National Electric Light Association.

"With certain obvious exceptions, practically all the criticism leveled at such industries as railroads and electric utilities, banks and insurance companies, etc., can be traced to the direction and inspiration of men who have been prominent in the councils of the Socialist movement," the foreword states.

"These men can see nothing good in any industry which is not the property of the state. They disagree with the whole scheme of American life."

Service Restored Promptly Despite Unusual Accident

A MONTREAL-NEWARK airplane blindly groping through a dense fog April 18 lost elevation near Newark, N. J., about 5:30 p.m. and flew into two 132-kv. lines between Marion generating station of the Public Service Electric & Gas Company and Hudson switching station. Both circuits were severed, the two ground wires at the tops of the towers, two conductors on the upper crossarms and a lower conductor being torn away.



Fog-bound plane crashed between A-frame and 132-kv. tower

This accident, occurring just about 800 ft. from the Marion station and involving a continuation of the 132-kv. bus connecting three large stations—Marion, Essex and Kearny—with a total rating of 709,300 kva., was virtually equivalent to an enormous bus short circuit. Despite this situation the circuit breakers on the low-tension side of the 132-kv. transformers isolated the fault very promptly, only one generating unit dropping out of synchronism due to the inability of the prime mover governor to respond so quickly to the abnormal load condition placed on it.

It is not surprising that such an accident should have interrupted service supplied by Hudson switching station to Hudson and Bergen counties for fifteen to twenty minutes. The surprising fact is that the enormous short circuit did not pull out of synchronism the stations and generating units which compose this concentration of power and thereby affect the whole system. The results are a tribute to improved circuit breaker design, relaying applications, use of sectionalized generating buses, design of step-up transformers and facilities for restoring service.

Owing to the fact that both 132-kv. lines feeding Hudson switching station were severed, the normal reserve of the duplicate feed could not be used. But reliability of service from Hudson switching station had been further insured by two 13-kv. feeds from Marion station. These circuits, stepping up through 13/26-kv. transformers, were substituted for the normal 132-kv. feed as soon as this was cleared. And complete service to customers was resumed in fifteen to twenty minues.

Meanwhile, repair of the 132-kv. spans was immediately started and normal 132-kv. feed re-established before people started going to work the next morning.

▼

Indiana Utilities Denied $70,000,000 Merger Right

PROPOSED merging of various Indiana utilities into a $70,000,000 organization, controlled by the Insull group, was rejected unanimously by the Indiana Public Service Commission last week.

"Any savings resulting from the merger of several kinds of public utilities and their operation as a unit must necessarily be absorbed by the deficits

of the electric interurban railway properties and could not go toward lower rates," the Public Service Commission said in its order April 18 denying an application for the consolidation of the Central Indiana Power Company, Terre Haute, Indianapolis & Eastern Traction Company and other utilities.

"The proposed merger, in the opinion of the commission, has nothing to offer advantageous to users of other kinds of service furnished by the properties involved, which would not be offset by disadvantages accruing because of the financial conditions of the railways."

Simultaneously with announcement of refusal of the proposal, receivership suits were filed against the Indianapolis Street Railway Company and the Terre Haute, Indianapolis & Eastern Traction Company by the Westinghouse Electric & Manufacturing Company.

Opponents of the merger feared that it would increase rates. The project was fought by Indianapolis.

Roosevelt Vetoes Bill to Establish Public Counsel

VETO by the Governor was the fate of the first of 39 measures submitted to the Legislature by the New York State investigatory commission on the public service law, of which Senator Knight is chairman. The Senate has passed 38 of the bills, 30 by unanimous vote, and the Assembly has approved 34.

"The entire purpose of this bill," said the Governor in his veto memorandum, "is based upon a fundamentally false conception of the proper function of a public service commission. It is not, and never has been, merely a court. It is rather intended to represent the public interest in connection with various industries of a semi-public character subjected to its jurisdiction.

"The testimony before the revision committee shows that whatever sentiment was developed in favor of a people's counsel was due to the recent letting down of commission activities.

"The bill would divide this responsibility for protecting the public. It would in effect reduce the Public Service Commission to the rôle of a near-utility court in which the people would have to fight their unequal battle against the huge resources of public utility corporations.

"The functions of the people's counsel provided for in this bill should be exerted by the commission through its own counsel, assistant counsel, or any

▼ ▼ ▼

ELECTRICAL CONDUITS GO TO SEA IN 620-FT. SECTIONS

Merritt-Chapman & Scott Corporation

Assembled on a pier and bent to fit the contour of the river bottom by an ingenious arrangement of end derricks which performed the desired shaping as the pipes were lifted, 620-ft. assemblies of 36 4-in. conduits were recently laid in the Harlem River at Spuyten Duyvil, New York City. More power for the electrification of the New York Central Railroad's West Side tracks was the reason. Four huge derricks floated each section into the proper position for trench placement.

other employees whom it wishes to designate therefor."

Speaking over the radio on Wednesday night, Governor Roosevelt praised the minority report of the investigating committee and pointed to comparative costs for energy in various communities to cite higher costs to the users with privately owned plants. Veto of other bills now under consideration was intimated by him.

Utility men assail reform bills at public hearing

All the bills in the series passed by the New York State Legislature with a view to strengthening the public service law were subjected to a running fire from spokesmen for the utility corporations who appeared at a public hearing before Governor Roosevelt last Friday. The hottest attacks were reserved for a bill giving the Public Service Commission broad regulatory powers over holding companies and one other seeking to render less convenient resort by public service concerns to the federal courts when rulings of the commission have gone against them.

Henry W. Killeen, representing the International Railway Company of Buffalo, made a spirited denouncement of the holding company bill.

"The bill," he said, "is an attempt to veto the power of the directors of a corporation to make contracts for it and lodge that power with the Public Service Commission. The critics of the utilities say that holding companies may abuse their powers, but there was not on the record of the Knight commission a single case of grave abuse of power by a holding company over a subsidiary."

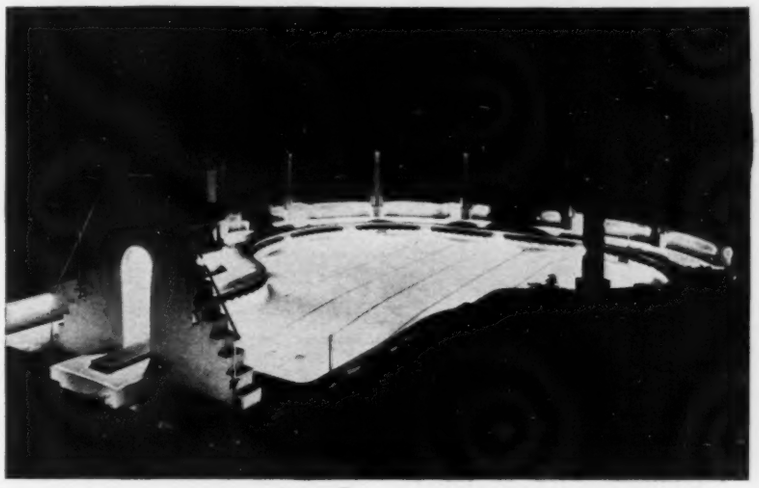
Governor Roosevelt broke in to say that the report rendered by William J. Donovan, counsel for the Knight commission, cited a long list of such instances.

"Why," said Senator Knight himself, "the record is just filled with cases refuting that assertion."

"Well, nevertheless," Mr. Killeen said, "this is an outrageous bill. This measure seeks to set up a bold inquisition over corporate affairs in the state and practically sets up as managers of the $3,000,000,000 utilities of this state five Public Service Commissioners. I hold that there are no five men in this state or anywhere else who could be trusted with such vast powers."

Governor Roosevelt objected to the bill calling for a statewide valuation of utility properties since it establishes no basis for valuation and no rate base. The Governor also called attention to the fact that the bill providing for rate making by contract had been changed. Senator Knight admitted that in its final form the bill merely extended to other utility corporations the provision in the present law under which, since 1922, municipalities had been making contracts with street railway corporations.

OUTDOOR NIGHT SWIMMING MADE EASY



Members of the Blythefield Country Club, Grand Rapids, Mich., have an illuminated outdoor swimming pool. Eighteen bronze floodlamps of General Electric manufacture, with 1,000-watt "Mazda" lamps and special heat-resisting lenses, are mounted in niches below the water line. A 200-watt light is used in each of ten ornamental pylons surrounding the pool. There are, besides, 15-watt lamps in recesses in the wall around the pool and 100-watt lamps in deep reflectors beneath the upper level of the diving platform.

▼ ▼ ▼

Mayors' conference approves all but people's counsel bill

The New York State Conference of Mayors went on record last week at a joint meeting of the conference's general legislative committee and special committee on public service as favoring all the bills passed at the recent session of the Legislature to reorganize the public service commission law and tighten state control over utilities, with the exception of that one providing for creation of the office of people's counsel in the department of law to represent consumers before the commission.

▼

$100,000,000 Inflation Charged in Massachusetts

CAPITAL inflation of more than $100,000,000 in excess of the amount of money the stockholders put into the properties was charged by John H. Fahey, chairman of the executive committee of the Public Franchise League, in testifying before the Massachusetts legislative committee on power and light. This, it is said, has resulted from the purchase of local light and gas companies by the group of holding companies which the special legislative commission reports has now obtained control of many of the operating companies in the state. Mr. Fahey also declared that the dividends of the companies absorbed were nearly all increased before they were taken over and have been still further increased since that time.

Increased capitalization in a number of communities referred to by the speaker were as follows:

Brockton, $6,000,000; Fall River, $6,000,000; Abington, $1,000,000; Springfield and other places served by the Western Massachusetts companies, $25,000,000; Cambridge, $9,000,000; New Bedford, $8,500,000; Worcester, $20,000,000; Lowell, $6,500,000; Quincy, $4,000,000; Lawrence, $7,000,000; Webster, $2,000,000 and Gloucester, $2,000,000.

The speaker said that if the companies were permitted to continue charging rates to support this exaggerated capitalization future reductions in rates which ought to be made will be prevented.

"During the years following the suppression of the annual reports of the Public Utilities Department, which began in 1922," it was further alleged, "the dividends of local companies in all sections of the state have been enormoney to the states was false, as their reports were stopped in order to save money to the State, was false, as their publication was paid for by the gas and electric companies themselves, and not by the Commonwealth."

Westinghouse Sets Up a Scientific Board

RECENTLY established, the scientific advisory board of the Westinghouse Research Laboratories held its first meeting in East Pittsburgh, Pa., last week. The aim of the Westinghouse Electric & Manufacturing Company in establishing this board is to bring before its specialists the latest and most advanced theories in the fields in which the advisory board members are prominent.

The members of the board are: Dr. P. W. Bridgman, head of the department of physics at Harvard University; Dr. G. B. Waterhouse, head of the department of metallurgy at the Massachusetts Institute of Technology; Dr. C. E. Mendenhall, head of the department of physics at the University of Wisconsin; Dr. Stephan Timoshenko, head of the school of advanced mechanics at the University of Michigan, and Dr. Edward Mack, Jr., professor of physical chemistry, Ohio State University. It is planned to have the board meet three times a year. The individual members will follow closely all research work conducted by the company and act in an advisory capacity on matters of pure science. Some members will serve for one year and the others have been appointed for two-year terms. Thus, as changes are made in the personnel, there always will be members who have served for at least one year.

Along with the formation of the advisory board, plans are being carried through for the enlargement of the present laboratories, of which S. M. Kintner is manager. An addition to the present building which will nearly triple its floor space is under construction at a cost of $500,000. The addition, which includes a large power house, will centralize the laboratories, some of which, through lack of space, have been forced to find quarters in the main plant.

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Calgary Utility's 132-Kv. Line Runs to Edmonton

THE Calgary Power Company's 132-kv. transmission line from the new Ghost plant to Edmonton, Alberta, a distance of 182 miles, is nearing completion and is expected to be in operation early in May. In addition to providing an outlet for power to Edmonton, this line will make hydro-electric energy available for the northern part of the company's system, now supplied by isolated steam plants or by power purchased. The company now has in operation or nearing completion 1,695 miles of transmission line, of which 180 miles is 132-kv. line and 400 miles is operated at 66-kv.

Pend Oreille Plans Altered as Fight Looms

A RADICAL alteration in the plans of the West Kootenay Power & Light Company for the development of the Pend Oreille River, in British Columbia, is foreseen in the filing of an application with the provincial government for the right to build two dams across this stream. Instead of one huge 350-ft. structure (ELECTRICAL WORLD, page 184, January 25, 1930), two are now proposed. It is considered likely that this change will reopen the long-drawn-out fight for water power between the West Kootenay company and the Reeves-McDonald mining interests. Authority to make surveys had been granted to the West Kootenay company on the condition that the utility agreed to supply power to the mining company.

The company's formal application, as filed with the Water Board, is entirely different from what the government had expected, on the basis of the company's earlier overtures. It calls for the construction of a dam 165 ft. high at Seven-Mile Creek, as proposed by the company over a year ago, before the larger single dam scheme was broached. In addition, a 150-ft. dam further down the river, at Cedar Creek, is projected now. The single 350-ft. dam at the mouth of the river which the company planned some months ago is not mentioned in the application.

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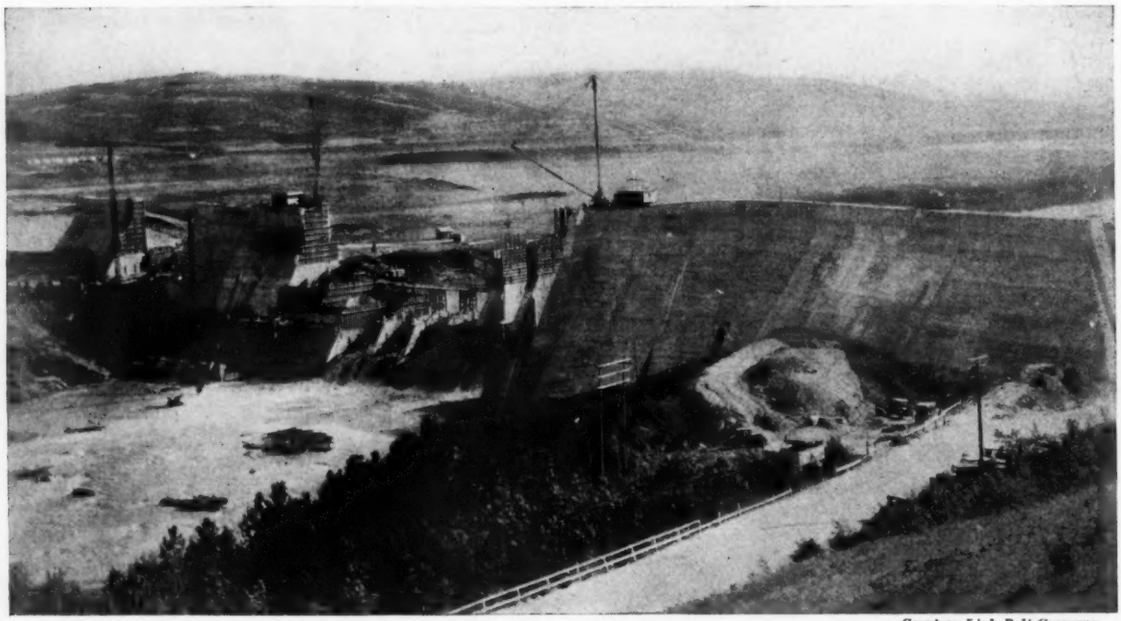
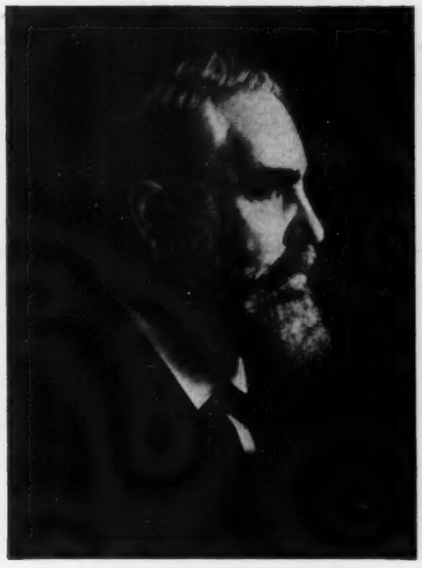
GHOST RIVER, ALBERTA, IS NOW VERY MUCH ALIVE



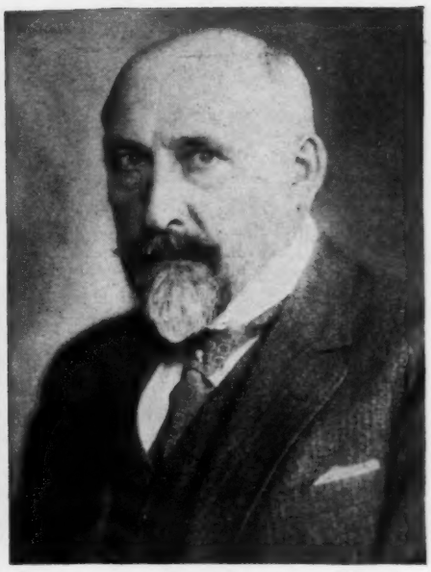
Courtesy Link-Belt Company.

Before spring is over the Ghost River hydro plant, in the Canadian Rockies, will, it is expected, add 36,000 hp. to the 19,000 hp. generated at Horseshoe Falls and the 13,000 hp. at Kananaskis on the same waters. The new dam, which is really on the Bow River, just below its confluence with the Ghost, is three-quarters of a mile in length and 110 ft. high. It is being built by the Calgary Power Company.

O. C. Merrill
Chairman American Committee



Dr. Oskar von Miller
Honorary President



Dr. Carl Koettgen
Chairman World Power Conference

Berlin Expects 3,000 at World Power Conference

BERLIN press dispatches say that delegates from 50 countries, including 300 from the United States, are expected to attend the second World's Power Conference, which is to be held in that city on June 16-23 under the sponsorship of President von Hindenburg, with Dr. Oskar von Miller as honorary president and Dr. Carl Koettgen as chairman.

While the primary purpose of the conference is to discuss the production and distribution of all kinds of power, the program will take a wide scientific and economic range. Albert Einstein will speak on "The Problem of Physical Space and the Ether," and other lectures will deal with solid, liquid and gaseous heating mediums, with steam and water turbines, with mechanical energy and with many phases of electricity, including long-distance transmission and recent researches in high-frequency currents. More than 400 papers have already been submitted for presentation. These will be distributed in printed form several weeks in advance of the Berlin sessions.

Industrial regions, including the Ruhr, in delegates' itinerary

The proceedings will begin with a reception on Sunday evening, June 15, in the Reichstag Building. A gala dinner will be given on June 18 and the special topical meetings will take place morning and afternoon throughout the week. Trips to all the industrial sections of Germany have been arranged to give the foreign delegates an opportunity to become acquainted with power practice in that country. The Rhineland and the Ruhr district, the water power plants of Baden, the brown-coal mines and plants in central Germany, the famous German Museum at Dresden and the coal mining of East Prussia and the Silesias will be among the points delegates are invited to inspect.

By means of a special device similar to that in use at the League sessions in Geneva, all speeches will be available in English, French and German at the same time. Translators sitting directly below the speaker will give a running translation which can be heard through head telephones or loud speakers.

Many well-known Americans have registered for the conference

Secretary of Commerce Lamont is honorary chairman of the American committee, of which the honorary vice-chairmen are Secretaries Hurley, Wilbur and Hyde, composing the Federal Power Commission; William H. Bassett, Charles Piez, Owen D. Young, A. W. Robertson, M. S. Sloan, S. Z. Mitchell, Samuel Insull and James H. McGraw. The executive committee has O. C. Merrill as chairman, Henry J. Pierce as vice-chairman, and includes H. M. Addinsell, Paul S. Clapp, Hugh L. Cooper, Alexander Forward, Elwood Mead, Calvin W. Rice, David B. Rushmore, George Otis Smith and Scott Turner.

Among Americans well known in power circles who have registered for the conference are the following:

Bechtel, E. J., New York.
Berg, Prof. E. J., Schenectady.
Brown, Wylie, New York.
Buell, James H., Chicago.
Christie, Prof. A. G., Baltimore.
Clark, F. S., Boston.
Clarke, C. W. E., Philadelphia.
Cushing, S. B., Chicago.
Delles, W. J., Schenectady.
Hamilton, G. W., Chicago.
Hodgkinson, Francis, Lester, Pa.
Holland, Maurice, New York.
Hutchinson, E. C., New York.
Jackson, J. P., New York.
Kennelly, Prof. A. E., Cambridge, Mass.
MacNeill, J. B., Wilkinsburg, Pa.
Matson, R. D., Elmhurst, Ill.
Monroe, W. S., Chicago.
Montsinger, V. W., Pittsfield, Mass.
Morrow, L. W. W., New York.
Moultrop, I. E., Boston.
Newbury, F. D., East Pittsburgh.
Orrok, George A., New York.
Rice, A. L., Chicago.
Robinson, L. T., Schenectady.
Rushmore, D. B., New York.
Sargent, F. C., Boston.
Sharp, C. H., New York.
Sibley, Robert, Berkeley, Calif.
Warren, G. B., Schenectady.

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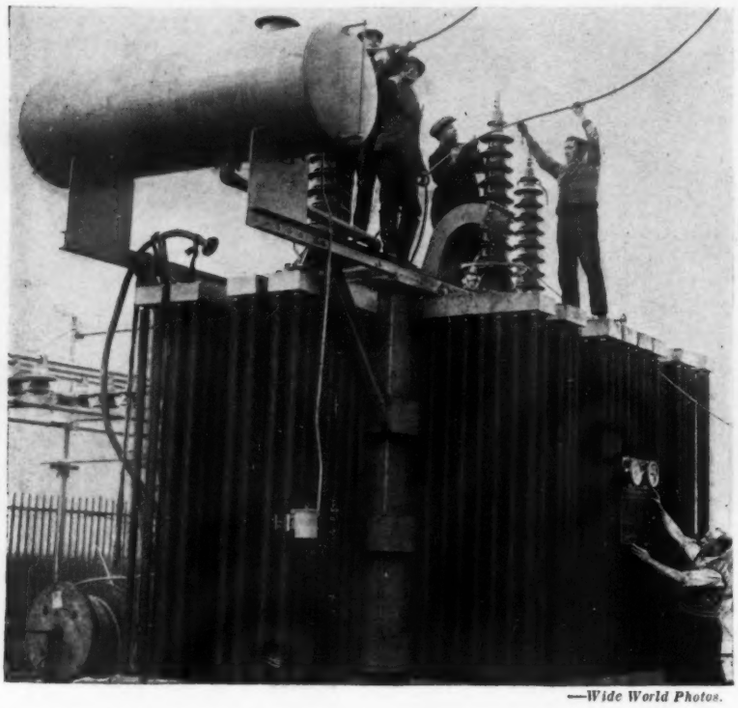
Westinghouse Lighting Institute Enrolls 6,000

APPROXIMATELY 6,000 students have been enrolled and are now taking the correspondence course in general illumination being conducted by the Westinghouse Lighting Institute, New York City, which has been made available without cost to those interested in lighting. Representing what is probably the largest attempt ever made for mass education in one subject by an industrial concern, the course, covering every phase of illuminating engineering, has been established to qualify employees of public utilities, manufacturers and merchants in the fundamentals of good lighting practice and the modern developments of the art.

The students enrolled are mostly employees of public utilities (75 per cent), industrial manufacturers, retail stores, commercial establishments, supply companies and jobbing houses. The enormous enrollment exceeded every expectation, and it has been decided to restrict its further enlargement for the present. Every state is represented.

AN OUTDOOR UNIT IN BRITISH "GRID"



—Wide World Photos.

This 150,000-volt transformer just installed at Bedford, England, marks the progress of the electric networks under way in that country. Distinguishing features of the transformer design are the use of the square case and the spiral fin-type radiators for oil cooling. Electric welding appears to have been used freely in the transformer assembly.

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Raise Boulder Dam 25 Ft., Plea of Colorado Board

BOULDER DAM should be 25 ft. higher than now contemplated, in the opinion of the Colorado River Board of Engineers and Geologists headed by Major-Gen. William L. Sibert, who built the Gatun locks and dam of the Panama Canal. The addition would make Boulder Dam 575 ft. high, the highest in the world probably.

"It is obvious," states the report submitted to Secretary Wilbur, "that a reservoir cannot be used to develop a stated amount of power and at the same time adequately regulate floods unless, after setting aside the storage required for the power, there remains sufficient storage for flood control."

The power to be developed at Boulder Dam was fixed at 550,000 firm horsepower. The board found that this power could be developed and that ordinary floods could be satisfactorily controlled, but that in the event of a great flood, such as that of 1884, it would be necessary to send as much as 160,000 second feet of water down the valley.

Saying it believed the change can be made within the adopted estimate of cost, the board emphasized that its approval of the increase in height "is based solely on the desirability of more effective flood control, and that the development of the power should never be a factor in the control of the flood storage space in the reservoir."

Other members of the board were Robert Ridgeway, engineer, of New York; W. D. Mead, engineer, of Madison, Wis.; Charles P. Berkey, geologist, of New York, and W. J. Mead, geologist, of Madison, Wis.

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Alberta Legislature for Public Ownership

PUBLIC ownership of power was indorsed as a principle at a recent sitting of the Legislative Assembly of the Province of Alberta. A resolution was passed providing that in framing policies for the administration of the natural resources of the province this principle should be fully safeguarded so as to facilitate the government undertaking the whole or such part of power development and distribution as it from time to time might consider economically sound and expedient.

Premier Brownlee, referring to the recent return of the natural resources to the province by the Dominion, said that there would be one governmental authority over the power sites and the province would take over every federal lease. In recent years, however, there has been a considerable spread of private utility companies, which have progressed until their holdings extend all over the province.

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Program of Institute for Massachusetts Meeting

FOR the sixth annual meeting of the Northeastern District of the American Institute of Electrical Engineers, to take place at Springfield, Mass., on May 7-10, some papers of more than ordinary engineering interest will be presented. Five technical sessions will be held, and ample arrangements have been made for inspection trips (including all-day trips on Saturday) and for entertainment. The tentative technical program in condensed form follows:

WEDNESDAY, MAY 7

Morning—Instruments and Measurements

"New Portable Oscillograph," C. M. Hathaway; "Self-Compensating Temperature Indicator," I. F. Kinnard and H. T. Faus; "Generator Speed and Retardation During Loss Measurements," O. E. Charlton and W. D. Ketchum; "M. I. T. Network Analyzer," H. L. Hazen, M. F. Gardner and O. R. Schurig; "Phase Difference in an Air Condenser," W. B. Kouwenhoven and C. L. Lemon; "Tensile Properties of Conductor Cables," G. W. Stickley.

Afternoon—Transmission

"Research and Design with the Field as a Laboratory," F. A. Andrews and C. L. Stroup; "1928 Lightning Experience on American G. & E. Lines," Philip Sporn; "Protection of a Transmission Line by Ground Conductors," H. B. Dwight; "Post-Type Towers," P. H. Thomas; "Arcing Grounds and Neutral Inpedance," J. E. Clem; "Fused Grading Shields," H. A. Frey and E. M. Skipper.

THURSDAY, MAY 8

Morning and Afternoon—Electrical Machinery

"Transient Currents in Transformers," H. M. Turner; "Effect of Transient Voltage on Power Transformer Design," K. K. Palueff; "Reduction of Eddy Current Losses," J. M. Lyons; "Effect of Armature Resistance Upon Hunting of Synchronous Machines," C. F. Wagner; "Calculation of Alternator Swing Curves," F. R. Longley; "The Synchronous Repulsion Motor," H. C. Specht; "Synchronous-Motor Effects in Induction Machines," E. E. Dreese; "Transformer Ratio and Differential Leakage of Distributed Windings," R. E. Hellmund and C. G. Veinott; "Calculation of Induction-Motor Performance," P. L. Alger; "Voltage Irregularities in Direct-Current Generators," J. F. Fetsch, Jr.

FRIDAY MAY 9

Morning—Selected Subjects

"Co-operative Courses," K. L. Wildes, M. I. T.; "Shunt Resistors for Reactors," F. H. Kierstead, H. L. Borden and L. V. Bewley; "Ship-to-Shore Telephone Service," L. Espenschied and W. Wilson; "Calculation of Cable Temperature in Subway Ducts," W. B. Kirke; "Relations of Measurements on Rubber Cable," C. L. Kasson.

Coming Meetings

Missouri Association of Public Utilities—Springfield, Mo., May 1-3. F. D. Beardslee, 315 North Twelfth St., St. Louis.

Southwestern Division, N.E.L.A.—Hot Springs, Ark., May 6-9. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

American Institute of Electrical Engineers—District meeting, Springfield, Mass., May 7-10; summer convention, Toronto, June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Manufacturers' Association—The Homestead, Hot Springs, Va., May 18-23. E. H. Hubert, 420 Lexington Avenue, New York.

East Central Division, N.E.L.A.—Hotel Statler, Cleveland, May 20-23. D. L. Gaskill, Greenville, Ohio.

National Electrical Credit Association—Hotel William Penn, Pittsburgh, May 22 and 23. F. P. Vose, 140 South Dearborn St., Chicago.

National Electrical Wholesalers' Association—Hot Springs, Va., May 26-30. E. Donald Tolles, 165 Broadway, New York.

American Electrochemical Society—St. Louis, May 29-31. C. G. Fink, Columbia University, New York.

North Central Division, N.E.L.A.—Managerial Section, Alex. Johnson Hotel, Rapid City, S. D., June 11-12. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Canadian Electrical Association—Manor Richelieu, Murray Bay, Que., June 11-13. H. M. Lyster, 405 Power Bldg., Montreal.

Pacific Coast Division, N.E.L.A.—San Francisco, June 16. S. H. Taylor, 447 Sutter St., San Francisco.

National Electric Light Association—San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.

Wisconsin Utilities Association—Accounting Section, Eau Claire, June 19 and 20; Electric Section, Lorain Hotel, Madison, July 17 and 18. Commercial Section, Green Bay, July 31 and August 1. J. N. Cadby, 105 Wells St., Milwaukee.

American Electric Railway Association—San Francisco, June 21-26. Guy C. Hecker, 292 Madison Ave., New York.

American Society for Testing Materials—Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce St., Philadelphia.

Association of Electragists International—Hotel Schroeder, Milwaukee, August 18-20. L. W. Davis, 420 Lexington Ave., New York.

International Association of Electrical Inspectors—Northwest Section, Bellingham, Wash., Aug. 25-27. F. D. Weber, 414 Lumbermen's Bldg., Portland, Ore.

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Uniform Rates in Quebec Replace Intricate Tariffs

AS THE RESULT of an ordinance handed down recently by the Quebec Public Service Commission approving rates submitted by the Gatineau Electric Light Company uniform rates for electricity will be substituted for complicated and varying schedules in 36 municipalities of the Laurentians. The ordinance is the first of its type to be issued by the commission since the inception of the movement among public utility companies of the province to ban intricate rate schedules on current fed through separate meters for cooking and lighting in rural areas and to substitute a one-rate, one-meter tariff.

The new tariff will include all lighting, water heating, domestic equipment, battery chargers, air heaters to a maximum of 1,000 watts and motors up to 3 hp. rating. The service charge will be 55 cents per month. The consumption charge for the first 50 kw.-hr. per month will be 6 cents a kilowatt-hour, then falling to 2½ cents.

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Missouri Commission and Municipal Plants

JURISDICTION of the Missouri Public Service Commission over municipally owned utilities will have to be decided by the courts of the state. This was made certain recently when the commission ordered a rate-base valuation and audit of the municipal light and power plant at Columbia, Mo. Consumers in that city are said to have complained to the commission that the rates charged by the city are too high and that earnings of the plant are being used for general municipal purposes. The city officials have ignored the commission, contending that it has not authority to regulate municipally owned facilities and asserting that the city will not pay the expenses of the appraisal which it has ordered.

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Another High Crossing Over Southern Mississippi

RIVALING the Louisiana Power & Light Company's plans to carry its 110-kv. lines across the Mississippi River at Bonnet Carré, La., on 420-ft. towers, the Baton Rouge Electric Company has submitted plans to the War Department calling for two 427-ft. high river-bank towers between which to hang a 66-kv. line. The War Department requires that the line be 150 ft. above high water.

This line will be used to connect the new Baton Rouge power plant with the Gulf States Utility system at Beaumont, Tex. The Baton Rouge plant is designed primarily to supply steam to the Standard Oil company refineries. While the production of electricity will be incidental, it is understood that there will be a large amount of power for distribution throughout the Southwest.

ERIE'S NEW FOUNTAIN

Erie, Pa., has recently joined the list of cities boasting an illuminated fountain. Thirty-five General Electric submersible floodlight projectors, provided with color screens and automatic water-pressure and color-changing control, give beauty to the scene at night.

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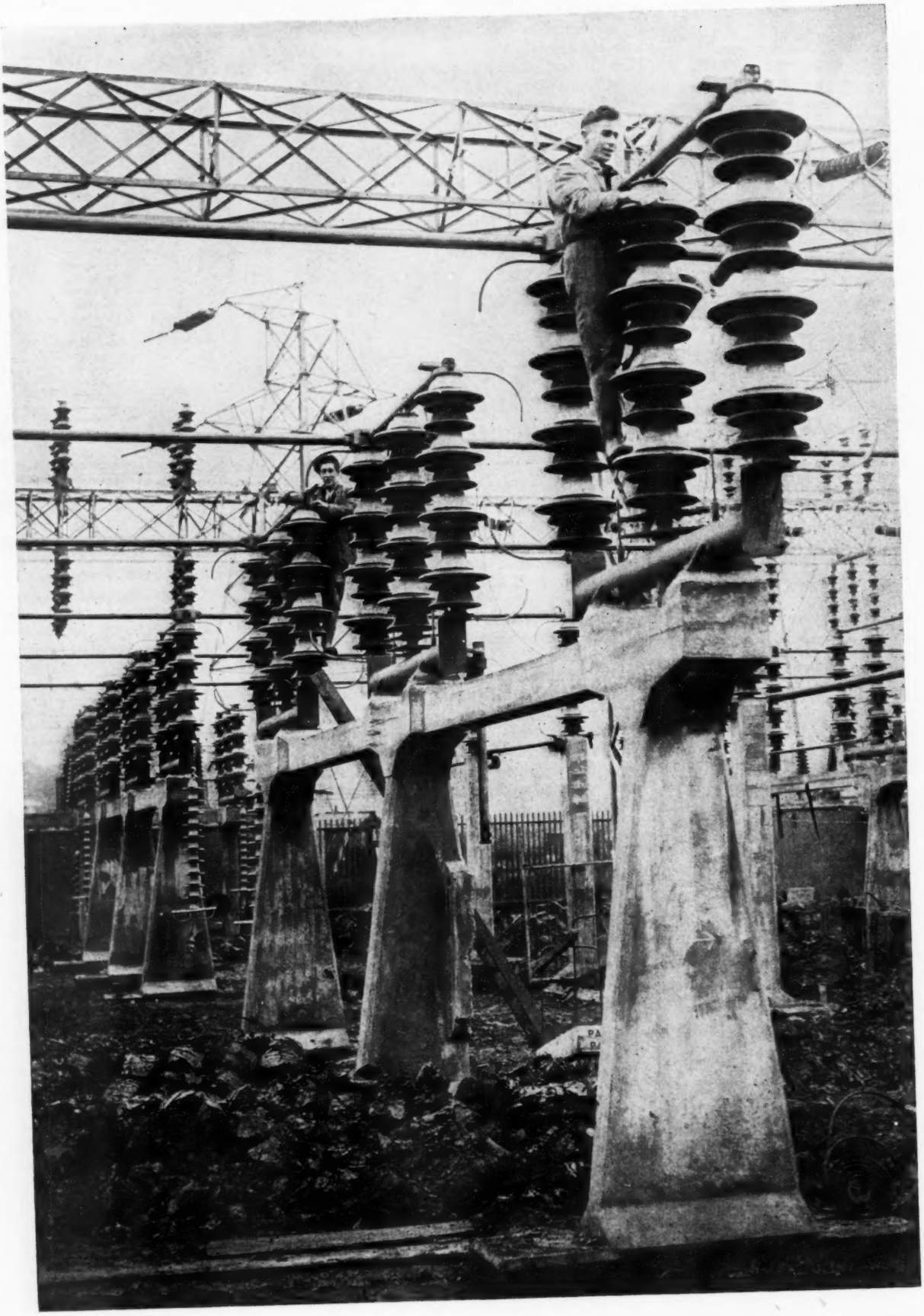
Modernization Program for Metropolitan New York

ELECTRICAL interests comprising contractors, utilities, engineers, manufacturers and wholesalers in New York have united for full co-operation to bring better electrical service to industrial power users through a modernization program. It is estimated that approximately 30,000 industrial establishments in Greater New York may benefit through this move. A central organization and local committee have been established and every factory in the area will be covered in an intensive campaign of education that will point out the practical opportunities that exist in almost every plant for the improvement of power applications and the elimination of waste.

Modernizing of equipment and methods embracing power application, control, materials handling, lighting and other production practices that will promote economies in costs to industry and the consumer alike will be the objective of the campaign. The program was announced at the April meeting of the Electrical Association of New York. Louis Kalischer is general chairman of the movement for the Electrical Association.



A WAY THEY HAVE IN OLD ENGLAND

EDITORIALS

L.W.W. MORROW
Editor

Socialization of Industry

SO LONG as human beings allow self-interest to guide their actions in dealing with large business enterprises the stream of commercial intercourse will never be free from ripples, cross-currents and whirlpools. The waters are stirred constantly by paddle wielders motivated by self-interest. The politician, the radical, the employee, the competing executive and the tides of public sentiment start currents that are apt to create a great weariness of spirit in the mind of the well-intentioned executive of a commercial enterprise. A little reflection, however, leads to the philosophical conclusion that these turbulences are inevitable and cannot impede the course of the main stream if its channels are well maintained and its flow is essential to national commerce.

Attacks on business to bring it into public disrepute occur in cycles, and one of these cycles is now in full swing. Back of the attempt to heckle, hamper and chastise big business at the present time is a very disturbing development because it is little recognized and its exponents keep in the background. This is the attempt to socialize industry.

The National Electric Light Association has just published a 96-page book containing a brief and exhibits developed for use in the federal trade investigation of utilities. It states that, "With certain obvious exceptions, practically all the criticism leveled at such industries as railroads and electric utilities, banks and insurance companies, etc., can be traced to the direction and inspiration of men who have been prominent in the councils of the Socialist movement. They disagree with the whole scheme of American life and seek the gradual socialization of all industry." The exhibits bear out this strong statement.

There is no need to be discouraged. The easy method for defeating such a behind-the-scenes campaign is to bring it into the open, where it must face public discussion of its merits. Public discussions are always constructive, for they are educational and eventually develop facts and opinions that fix national policies that are sound. Pitiless publicity brings out the hokum in business and in socialism as well. It is the answer to the present attack on utilities and on business in general.

Circuit Interruption—A Rapidly Changing Art

SCIENTIFIC and practical aspects of the electric arc are undergoing revolutionary changes as applied to circuit interruption. One of the cycles that occurs at indefinite intervals appears to be happening with respect to circuit breakers. It seems that a few years will bring about entirely new and much improved apparatus in this field that appeared so limited in development a year or two ago.

Several things forced the new development or made it possible. Large energy concentrations, the requirements for system stability, higher standards of service, improved relays, instantaneous fault isolation and other growth factors brought pressure to bear on the development of a better, higher rated and quicker acting circuit breaker.

The consensus of opinion is that Dr. Slepian opened the door to new developments by his more detailed analysis of arc phenomena and arc interruption whereby he arrived at a physical explanation of arc behavior based on the physics of ionized gases. In essentials, arcs could be inter-

rupted best by deionizing the gases in the electric arc.

This conception has led to many practical and ingenious developments of apparatus to bring about rapid deionization of the arc gases. These involve the interposition of oil compartments in the arc stream, of placing the arc in proximity to metal deionizing surfaces, of forcing the arc by magnetic fields or by air blasts into contact with deionizing material, of using pressure to get oil or air into the arc stream—many ways have been tried to deionize the arc gases rapidly.

Whatever may be the true explanation of arc behavior, the ionized gas conception has enabled circuit breaker designers to improve circuit breakers very greatly. But, in addition to this element of arc treatment, a corresponding and equally important development was had in the mechanical improvement of breakers. The mechanisms were changed, the strength increased and the speed of operation was made very rapid. High-voltage oil breakers can now be counted upon to open a circuit in 8 cycles. This development in both high-voltage and low-voltage breakers is a great engineering accomplishment. It means better and cheaper electric service.

The "Lost Chord" in Industrial Operation

A PRODUCTION efficiency level of 97 per cent—that is, only three "rejects" out of one hundred pieces of finished goods—was once attained and held for two weeks by a bottle-making plant. This efficiency of production is rather a remarkable performance in glass-bottle manufacture. As in any other complex manufacturing process, there are in the making of bottles a large number of factors such as temperatures, pressures, speeds, periods and others, as well as conditions and constitutions of materials, raw and in process, that must be in varying degrees of control if the product is to be of the intended quality. When the production record of 97 per cent was made the factory was operating under the normal control conditions. No attempt was made to tune up for a record beforehand; it just happened that circumstances arranged themselves so as to produce that result. And since that memorable period of two weeks the operators of the plant have cudgeled their brains to learn just what the circumstances were and just what was their arrangement.

Was there ever a better argument for continuous data records of production control? In this case, if such data records were available, a study of them might easily reveal exactly why and how only three bottles in a hundred were for two weeks thrown out in final inspection. If Sir Arthur Sullivan had had his organ continuously equipped with an adequate installation of recording meters, the famous "lost chord" would never have slipped away from him. There are "lost chords" in industry, too. But in industry there should be not even the small excuse of artistic temperament on which to blame the loss.

Electric Heat Benefits Gained and Lost Easily

A PERIPATETIC technical editor came to the stereotyping room of a great newspaper. Here were two huge eight-ton pots, each electrically heated by 360 kilowatts of resistance units. Fumes were withdrawn through carefully planned ventilating ducts. A wholesome glow from well-chosen fixtures lighted every corner of the room. Workmen's clothes were clean and neat, the shop immaculate. Everything went smoothly; production appeared effortless and unhurried. Here, thought the editor, is electric heat at its best.

A day or two later the same itinerant individual arrived hopefully at the doors of a great industrial plant. "I hear that you use electric heat for thus and so," he ventured. "Oh, yes," replied the superintendent; "have a look." Three or four tanks from which arose thick clouds of vapor stood in foggy gloom, surrounded by wooden racks and bales of raw material. Workmen coughed and cursed wearily. Five dirt-incrusted vapor-proof units fought feebly against the insuperable difficulties of improper placements, smoke, low-power lamps and general depression.

"Why," hesitated the appalled editor, "do you

use electric heat here?" "Better than oil burners," was the reply. "We need 400 degrees in these baths, and our steam system won't give it." "But those lights, the overhead circulatory fans, the old unused ventilating system, and the arrangement of work. Why don't you take advantage of what electricity can do for you?" coughed the editor as the acrid fumes gripped him. The superintendent responded in a weary echo: "Electricity helped a lot here. We can save the cost of running the fans now. It makes up for the extra cost of the electric heat." And the editor wondered about this and that and the other thing—the benefits of electric heat, the value of light, the economies of forced ventilation, the bases of production —and how little more it would have cost to do the job the electric way.

Facts Versus Opinions in Engineering

GEORGE E. SEABURY of the Boston Edison Company recently told the Engineering Societies of Boston that a more critical attitude on the part of executives and engineers toward capital expenditures is bearing fruit in diminished waste and more rapid improvements in plant of many kinds. The engineer is getting away from the old idea that "the best is none too good" and is scrutinizing with an "embarrassingly inquisitive mind" every phase of his problems. This viewpoint has created skepticism as to value of equipment and practices which have been long in use.

Years ago Mr. Edison confessed his inability to examine any device from an eggbeater to a locomotive without analyzing the possibilities of its improvement, and today the engineer is never satisfied that the last step has been taken toward perfecting either apparatus or processes. The modern attack goes forward on the basis of facts rather than of opinions, and, as Mr. Seabury pointed out, enormous strides have been made in the past ten years in engineering research and experience, so that there is now very little excuse for making some of the engineering blunders of the past. "To err is human," but to repeat an engineering mistake is an economic crime.

Wisconsin Starts on Merchandising

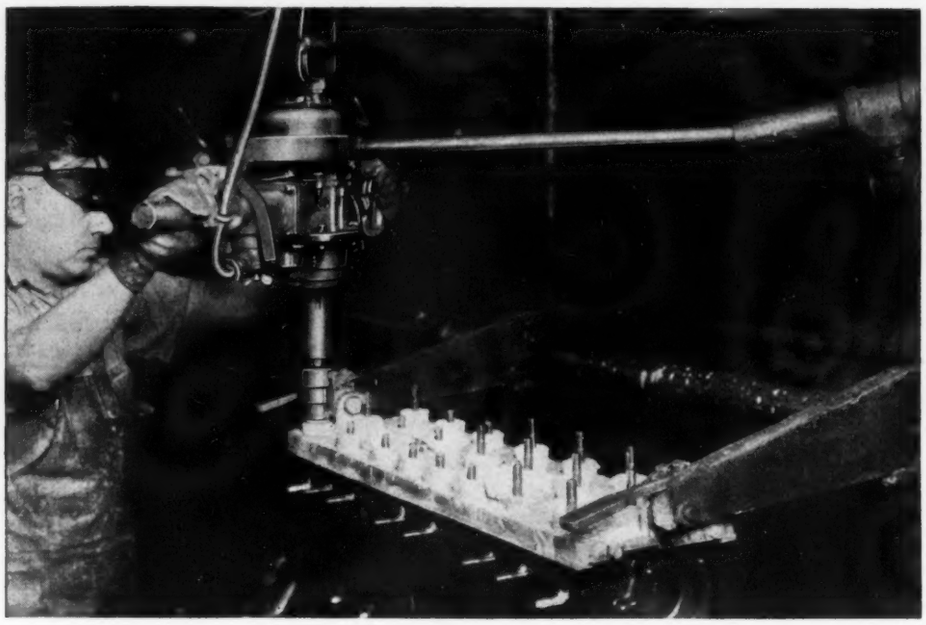
THE Legislature of the state of Wisconsin has passed an act that makes all light and power companies divorce merchandising from other utility operations. The state commission now faces the task of setting up an accounting system that will allocate and itemize merchandising costs and accounts. It is having trouble in carrying out this purpose.

Merchandising is part of load building and business promotion. It is not a well-defined utility department and it interlinks with employee sales, office space, servicing of equipment, promotional campaigns, free lamp renewals, financing of sales, industrial sales and co-operation with other sales outlets. How can the costs involved be separated and why should they be singled out for special accounting treatment?

Direct sales by a merchandising department and staff is only a minor part of the load-building efforts of a utility. The obligation and conscious effort of a utility is to develop the idea of using electricity and electric appliances, and the more it convinces its customers of these values the greater benefit the customers get in the form of improved service and lower rates. This is the realm of promotion and education wherein difficulties arise as regards cost allocations. It is unfair to charge all these costs to merchandising and equally unfair to charge them all to operating expense, and it is to be hoped that the Wisconsin commission will arrive at an equitable decision in the subdivision of merchandising, servicing and promotional expenses. It might be well for the industry itself to undertake a similar analysis. This work would check that of the Wisconsin commission.

This will be a constructive move to get some uniformity in accounting methods and, judged on past records, the Wisconsin commission will arrive at a fair and workable conclusion that can be used by other states. Differences of opinion may exist as to the basic policies involved and the intelligent use of the accounts in rate making, but some standardization will work to the benefit of merchandising departments and establish a factual background for building sales and establishing co-operative merchandising practices.

High-Frequency Portable Tools



Screwing studs in Reo cylinder-block

The jig fixture resting on the motor head was designed by the user to obviate starting the studs by hand. It also acts as a stop for limiting the heights of the stud settings.

THE idea of the high-speed electric tool, admittedly a good one, did not make much progress for many years because it was pitted against devices that were accepted in their fields and change from them was difficult, whatever improvement the new departure might promise. But at last, in Detroit, the promoters of an automotive plant found themselves forced to spread finances pretty thin when they began to equip their plant with production machinery. Among the major items that worried them was the necessary expenditure for portable tools for the many grinding operations in body manufacture. Air compressors, pipe runs and hose lines, added to the cost of the pneumatic tools themselves, totaled up to a formidable expense. Then some one suggested the use of the high-frequency electric tool. Including all equipment, this tooling cost about 70 per cent less than the pneumatic, but it was untried. Was it worth the gamble? The wide acceptance that the high-frequency tool has had in the very few years since the chance was taken has amply proved that it was. Up to October, 1929, one company alone had sold nearly 10,000 of these tools in the automotive industry, about equally divided between automobile and automobile body manufacturers. A conservative estimate of the number in use in the automobile industry centering around Detroit would not now be less than 30,000.

High-frequency portable tools belie their name. They are not high frequency in the usual meaning of the term in its application to vacuum tube employment, oscillatory phenomena, and the like. The frequency used is 180 cycles.

The portable tool as an important agent in manufacturing processes has had its greatest development in the automotive industries. On a production line turning out several hundred motor cars a day handwork was too slow. The result was the development of a line of power-driven screw drivers, nut runners, reamers, drills, stud runners, sanders, tappers and what not, all designed to permit a little acceleration of the forward movement of the work on the line. For many years these special tools were air and electrically driven, with the former energy form in much the greater favor. The air drive was preferred because it permitted a light-weight, high-powered tool of very simple design. The electric tools were mostly of the universal-series wound-motor type because this motor could be made in a high-speed, light-weight form.

But the universal motor has inherent speed-load characteristics that put its use in these tools rather in the class of making the best of a poor condition. Some attempt was made to utilize the three-phase induction motor, with its better speed maintenance, lack of brushes, commutator, etc., but the top speed thus attainable of 3,600 r.p.m. required a comparatively large and heavy motor for the necessary power application on the tool. Thus with one form of electrical application could be secured light weight at the expense of speed regulation and with the other good speed regulation at the expense of weight. The air tool combined a considerable proportion of the virtues of the two electrical types with a minimum of their deficiencies.

However, the pneumatic tool had its own peculiar disadvantages, which, while they were not sufficiently strong to turn the scale in favor of the then available

Effect Spectacular Economies

OPERATING costs reduced in the ratio of one to seven. Such a claim, in these efficient days, is a powerful argument against complacency and satisfaction with things as they are. And, from the large amount of evidence available, the claim apparently is true. It refers to the greatly lowered costs brought about in the field of portable tools by the introduction of a tripled frequency in the current supply of the driving motors.

THE spectacular performance of high-frequency tools since their development only three or four years ago is only another indication of what can result when ingenuity and original thinking tackle problems in the industrial applications of electricity. It is possible that the tube oscillator may be used in the future to give a wide range of frequency for motor applications.

electric tools, yet would come into consideration if a better electric tool offered itself. These disadvantages included first cost of the tools and accessory equipment and also the continuing costs of operation and maintenance. The efficiency of conversion from electric to air power is not high, leaks in pipes, in hose lines and in the tools themselves are constant and important losses, and the hazards attendant upon the use of high air pressure turned, frequently enough, into actual damage.

High-frequency tools best suited to multiple installations

Conditions were right for a new development in portable tools. After the high-frequency tool had proved itself there was practically a general abandonment of the production field to it. But this does not include the whole of the portable tool field. Because the high-frequency motor requires a special energy supply, the universal motor still retains its place where only one or a few tools are used and, of course, there has been no displacement of percussion air tools.

The use of power frequencies above the commercial standard is not a new thing in industry. For many years stationary woodworking tools, such as shapers, molders and planers, built for motor speeds as high as 18,000 r.p.m. have been in use. But these applications remained of a distinctly specialized nature and there was little frequency standardization in the field, each manu-

High-frequency nut runner

This tool is working on dual rear wheel for heavy-duty Reo Speed Wagon driving rim nuts on ⅞-in. bolts. The tool has a cushion clutch which sets the nuts to a predetermined tension without any need for hand tightening.

facturer of woodworking machinery having his own ideas of the motor speeds to be used in his product. In some cases speed control of a machine might be vested in the frequency conversion equipment, the induction converter being especially handy in this regard.

The high-frequency motor is three phase, 10,800 r.p.m., 220 volts standard, although one or two installations have been made at 110. The three-phase motor is used to get away from the mechanical adjuncts necessary to the repulsion induction or split-phase, single-phase types. The rotor is a simple low-resistance squirrel cage. In one stroke the high-frequency motor eliminates those features—commutator, carbon brushes, wound armatures rotating at high speeds — which make the universal costly to maintain. Because of its much better speed regulation the high-frequency machine, in comparison with the universal, definitely prolongs the useful life of cutting and abrasive tools such as reamers, drills and grinders. This is also an advantage over the air tools, in which speed is variable over a wide range. As against both the universal motor and piston type air tools the high-frequency machine has a fewer number of parts, thus reducing the problem of maintenance and storekeeping. The tabulated comparison between equivalent high-frequency and air-operated tools shown here is a theoretical one, but is sufficiently accurate to illustrate in a general way the large differences in cost between the two types.

Detachable trolley contact

This device, made by the Bulldog Electric Products Company, permits the trolley contact to be detached and carried around another connection or to another part of the plant.

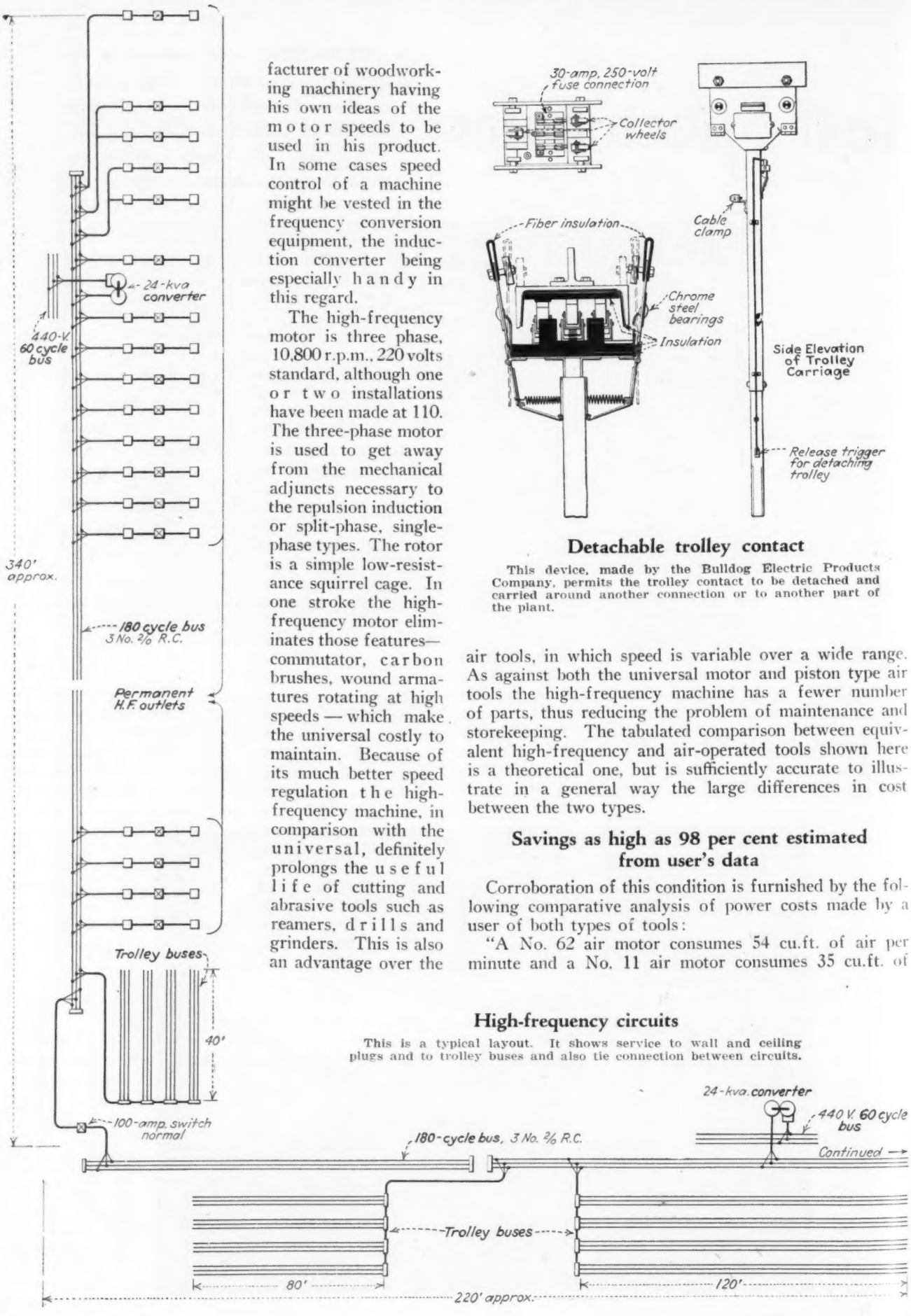
Savings as high as 98 per cent estimated from user's data

Corroboration of this condition is furnished by the following comparative analysis of power costs made by a user of both types of tools:

"A No. 62 air motor consumes 54 cu.ft. of air per minute and a No. 11 air motor consumes 35 cu.ft. of

High-frequency circuits

This is a typical layout. It shows service to wall and ceiling plugs and to trolley buses and also tie connection between circuits.



air. Our cost department places the price of air at 33 cents per 1,000 cu.ft., which is somewhat below the ordinary estimated price, it being sold in large cities at 70 cents per 1,000 cu.ft. At 33 cents the No. 62 motor would cost $0.0178 and the No. 11 motor would cost $0.0115 per minute.

"An electric nut runner of No. 0 size, equivalent to a No. 11 air motor, uses 1¾ amp. per phase of 220-volt, three-phase current, or a power consumption of 679 watts. At our average power rate of 1.75 cents per kilowatt-hour this tool would cost $0.0121 per hour, or $0.000203 per minute. An electric nut runner of No. 5 size, equivalent to a No. 62 air drill, uses 4 amp. per phase average or a power consumption of 1,592 watts. At 1.75 cents per kilowatt-hour this tool would cost $0.0278 per hour, or $0.000464 per minute."

Power Costs per Minute Compared

No. 62 air motor	$0.0178
No. 5 electric runner	0.000464
Saving	$0.017336
Per cent saving	97.4
No. 11 air motor	0.0115
No. 0 electric runner	0.000195
Saving	$0.011305
Per cent saving	98.3

Considering that in some plants portable tools are numbered in hundreds, it is quite apparent that the high frequency as compared with the air type permits important economies in power cost alone. Relative to the universal motor type the power cost saving is not so striking, being estimated as 10 to 20 per cent.

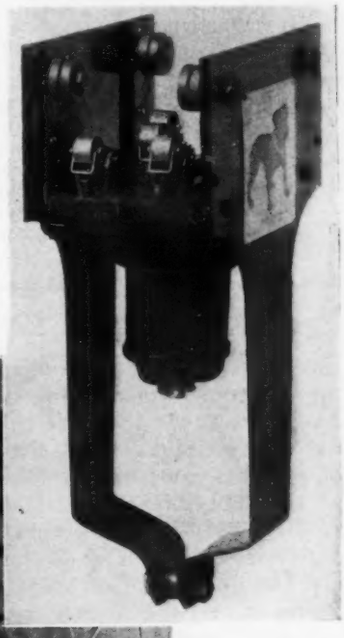
The principal advantage over the universal motor is in maintenance. According to the records of the electrical engineer of a large manufacturer of automobile bodies, the maintenance cost per month for a universal grinder in use on three eight-hour shifts is $3.41, while the high-frequency grinder for the same period and use costs only $1.11. This engineer states the advantage of the high-frequency tool over the air type as being largely in first cost and instances the following example:

36 high-frequency grinders	$3,340.00
Two frequency changers	1,766.00
Wiring	720.00
Total	$5,826.00
36 air grinders	3,340.00
One air compressor	12,303.00
Outlets	250.00
Total	$15,893.00
Saving in favor of high frequency	$10,067.00
Per cent saving	63.3

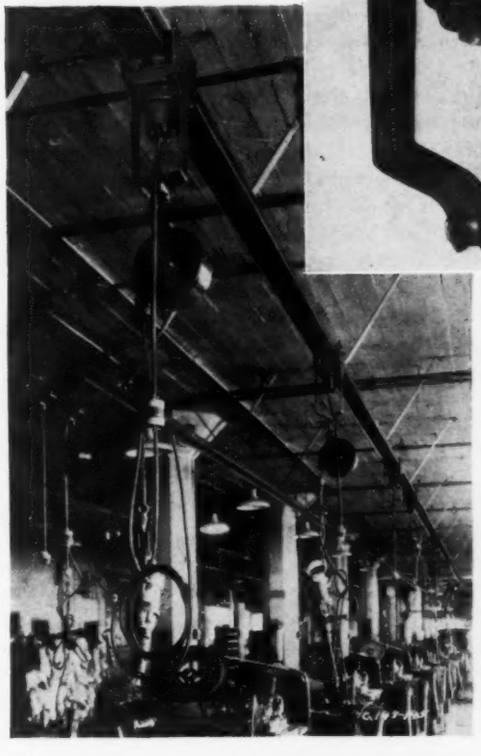
Contact devices of trolley type have production line advantages

The connector cords for high-frequency tools contain four conductors, the fourth being a ground lead which is connected to the tool frame and at the other end to the conduit body or to some grounded metal part or other connection devices. In locations where the working stations of tools are fixed, contacts are usually made in receptacles installed in the conduit system on ceiling or side walls. Lare use is made of a trolley type of contact, by the use of which the useful working area of a single tool is greatly enlarged. Two such contacts are in use. One is a semi-permanent type which must be dismantled to remove it from the trolley line and the other is a portable which may be engaged and disengaged by manipulation of a downward projecting handle. The conductors are carried in a trough open at the bottom and on whose top ride the supporting wheels of the trolley body.

Trolley contactor, non-detachable



On the production line



Tools are hung from Pedwyn balancers attached to trolley contacts which permit operation over considerable distances along the production line.

Two kinds of conversion equipment are in common use, each one, by reason of its special virtues, taking its share of the field. For large capacities, that is over 100 kw., the alternator, driven by a synchronous motor, is conceded to be best. Alternators driven by induction motors compete with induction converters in the medium sizes, and most of the smaller ones are of the latter type. The advantages of the induction converter are low cost and simplicity of installation. Since this machine—in essence simply a wound-rotor motor driven backward at double speed and the 180-cycle energy taken off the

Convincing Evidence

The most convincing evidence of the industrial value of the new high-frequency tools comes from the men who are responsible for their economy and satisfactory operation under the pressure of the high-speed production requirements of the automatic industry:

E. H. WILSHER, *electrical engineer Dodge Brothers Motor Car Company:*

"With a high-frequency nut runner one man can set from 1,700 to 1,800 nuts per hour, formerly the work of two or three men, and in most cases do a better job. The horsepower and weight of these tools compare very favorably with the air tools and they maintain practically a constant speed, whereas the speed of the air tools varies with the load. The operating cost of the hicycle tools is much lower. The ratio would be about 5 to 1 in favor of current over air."

GEORGE M. OWENS, *electrical engineer Briggs Manufacturing Company:*

"We use over 1,500 high-frequency tools, of which about 450 are grinders. The men like them better than air or universal tools because, working on a piece basis, they can turn out more work. The universal tools have heavy maintenance costs, and with air tools a large part of the money put into compression is wasted before the air gets to the tools and in them also. Under the best conditions a small per cent of compressed air is always lost and usually the amount is much more due to leaks in hose and connections. Replacement parts for the high frequency cost less and they are easier to get."

H. L. BOGARDUS, *electrical engineer Packard Motor Car Company:*

"Energy in the form of compressed air costs more to generate than in the form of electricity. Line losses in air pipes and hoses are higher than line losses in electrical conductors. The light-weight, high-frequency tool permits a facility of operation that shows itself in better and faster work on the production line."

collector rings—supplies about two-thirds of its output through transformer action between stator and rotor, the conditions of the 180-cycle circuit are reflected back into the supply circuit. Since the characteristic load factors of portable tools are never high, their power factors at no load quite low and their starting and stopping cycles rather rapid, the high-frequency load, although considerably smoothed out by diversity, remains one of definite ups and downs and of average low power factor. The alternator type converter removes these factors, but, requiring external excitation, it costs more and requires more elaborate control equipment.

The general practice is to operate each high-frequency circuit, with its supply converter, as a separate unit. Paralleling is not impossible, but the benefits to be gained by it are not usually thought be worth the trouble. On account of the fact that conductor losses—proportional nearly to frequency—are high in these circuits, there is a tendency to keep circuits short and converter units comparatively small or medium sized. This permits the utilization of the overload capacity of the adjacent units as standby, if the machine between them goes out, by splitting the affected circuit between them. This practice is favored by the usual type of building construction, long and narrow, housing production lines. For instance, one building in which automobile bodies are manufactured is 2,800 ft. long and only 90 ft. wide.

Comparison of Typical Tools—Equivalent High-Frequency and Air-Operated

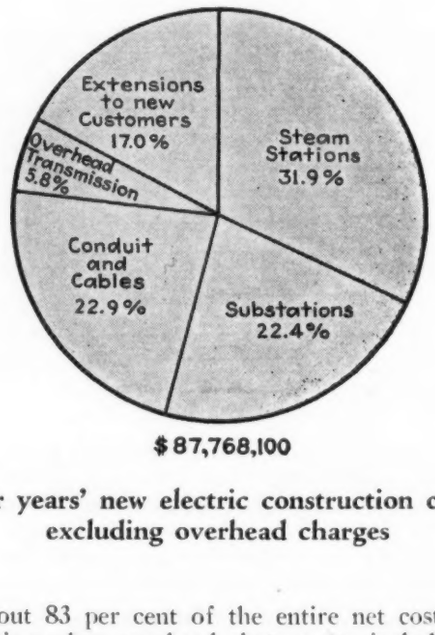
Feature	High Frequency	Air	Saving, Per Cent
First cost (per cent)	83.3	100	16.6
Power (watts)	1,014	6,714	85
Parts (number)	31*	66†	53
Weight (lb.)	14	21	33.3
Speed regulation	8	35 to 50	....
Energy supply unit	$900.00	$6,000.00	85

*Sixteen of these 31 parts are standard open market items easily available from local electrical distributors.

†Does not include screws and lock washers.

Customer Extensions Take a Sixth of New Money

STEAM STATIONS absorbed nearly a third of the money spent for new construction by the Detroit Edison Company over a four-year period, exclusive of overhead charges; stations, substations and additions to the latter together took somewhat more than half; one-sixth of the money went into extensions to new customers. In addition, non-electrical new construction absorbed another $5,594,600, not included on the accompanying chart. The combined construction costs constituted about 83 per cent of the entire net cost of new construction when overhead charges are included. The figures are based on data in the company's annual reports.



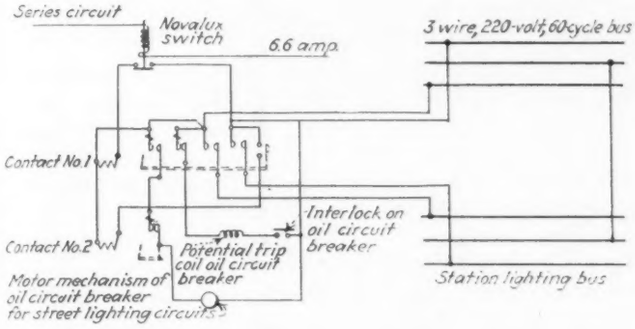
Four years' new electric construction costs, excluding overhead charges

Series Lighting Loop Controls Substation Circuits

By R. S. PADEN
General Electric Company, Atlanta, Ga.

THE new Tenth Avenue substation of the Columbus Electric & Power Company is entirely automatic and has no attendants. This substation controls three 11,000-volt power circuits, 1,500 kva. in 2,300-volt distribution circuits and two street-lighting circuits of 25 kw. capacity. All oil circuit breakers are the automatic reclosing type.

The whiteway and overhead street lighting circuits in Columbus, Ga., with the exception of the two circuits


Series circuit
Novalux switch
6.6 amp.
3 wire, 220-volt, 60-cycle bus
Contact No. 1
Contact No. 2
Interlock on oil circuit breaker
Potential trip coil oil circuit breaker
Motor mechanism of oil circuit breaker for street lighting circuits
Station lighting bus

Four-pole contactor operated by street lights controls substation lighting circuits

in the Tenth Avenue substation, are manually controlled at the steam plant, approximately 2 miles from the Tenth Avenue station. This company did not want to use time switches to control the two street-lighting circuits in the new station so the following scheme was devised:

One of the 6.6-amp. series circuits controlled from the steam plant passed one block from the new station. A "Novalux" series control switch (pole type) with a 6.6-amp. series operating coil and a single-throw contact rated 25 amp. at 125 volts was connected in this circuit. When the series circuit is energized from the steam plant the "Novalux" contactor closes its single-pole contact and when the circuit is de-energized the contact is opened. This single-pole contact was wired to control the operating coil of a four-pole type contactor with a definite-time relay and also the operating coil of a single-pole contactor. The four-pole contactor is No. 1 in the accompanying sketch and the single-pole contactor is No. 2.

When the contact of the "Novalux" series control switch is closed the operating coil of contactor No. 1 picks up. Two normally open poles of this contactor close and cut on the lights inside and outside the substation building. One normally open pole closes and energizes the motor mechanism of the oil circuit breaker which controls the two 25-kw. constant-current transformers. The fourth pole of the contactor is normally closed and this opens and remains open as long as the operating coil is energized. When the operating coil is de-energized this pole closes and energizes the potential trip coil of the oil circuit breaker and this cuts off the series circuits.

When contactor No. 1 closes, the interlock which is provided on the end of its shaft operates with a definite time-delay sequence. This is accomplished by means of a definite-time relay adjustable over a range of from one to eight seconds. When this interlock closes it energizes contactor No. 2. The single-pole contact of contactor No. 2 is connected in the control circuit of the motor mechanism of the street-lighting oil circuit breaker and is normally closed. When contactor No. 2 is energized, after the definite time delay, this contact opens and this opens the control circuit of the motor mechanism and prevents the oil circuit breaker from pumping in case of trouble in the constant-current transformers.

▼ ▼ ▼

Safety Activities on Electrical Properties

AS AN AID to the development of further safety activities, the Empire State Gas and Electric Association of New York, through its accident prevention section, requested from its member organizations detailed information concerning the type of safety work conducted by it, both among employees and the general public.

Replies were received from 24 companies or systems, having 55,287 employees and furnishing 90 per cent of the service in New York State. These replies were referred to the Safety Service of the Policyholders' Service Bureau, Metropolitan Life Insurance Company, for study and analysis. The following comments are based upon this study:

Hold foremen responsible for accidents

Experience has demonstrated that successful accident prevention work among employees depends largely upon the amount of interest and leadership accorded it by executives and the support which is obtained from the supervisory force. In sixteen of the New York utilities regular meetings of superintendents and department heads are held to discuss company policies and the work program, executive interest is shown in the subject, and the prevention of accidents is emphasized as a supervisory duty. These meetings are held monthly in most cases, although in some instances they are called weekly, quarterly or semi-annually. Various officials preside, among whom are the president, vice-president, general manager, general superintendent and director of personnel. Where safety matters are discussed largely, the chairman of the central safety committee or the safety director frequently presides.

A review of safety activities shows there is an increasing tendency to encourage foremen to hold informal meetings of their employees, during which the accident experience of the past month is usually reviewed and measures for the prevention of recurrences are discussed. Such meetings serve to arouse departmental pride and

to encourage safer workmanship. Fourteen of the reporting utilities have adopted this plan, the majority of the meetings being held monthly.

To maintain the interest of the foremen and others, it is considered advisable to provide them with monthly reports, showing the personal injury records of their respective departments and the trend of the company's accident experience. Most of the organizations co-operating in this study follow this procedure. Only two do not furnish reports to department heads; seven do not keep the foremen informed of the monthly accident record. In one case each foreman is supplied with a copy of accident reports issuing from his department.

As an additional means of stimulating supervisory interest, many industries charge the cost of accidents to the operating expenses of the departments in which they occur. This plan is not being followed generally by the gas and electric utilities of New York State. In one organization accidents are charged to superintendents and department heads; in another to the foremen. In a third organization, although no direct charge is made, the accident records of foremen are considered when advancements and promotions are made.

Safety director reports to executive

Although the prevention of accidents is recognized as a function of management and supervisors, many companies place some individual in charge of the details of the work, to serve in a consulting capacity to the executives and department heads and to help co-ordinate the safety activities of the various departments. This practice is followed by the majority of reporting companies. In five cases, a staff in charge of a full-time director of safety is employed for the purpose; on five other properties simply a full-time director is engaged. Small companies in which the organization of a safety department is unwarranted conduct accident prevention activities through safety council or committee membership, by assigning the work to a production executive, a safety inspector or to employees devoting only part time to safety. Among those activities which are often combined with part-time safety work are public relations, employee welfare, insurance, personnel work, claim adjustment and fire prevention work.

As the safety engineer must be one who can command the respect of the working force and by his position indicate the interest which the management has in the accident prevention activities of the plant, it is usually considered important to have him report to an executive of the company. In four of the reporting companies the safety director reports to the president. In seven he reports to the vice-president. Other officials designated for this purpose include general manager, secretary and, in one case, the purchasing agent.

Eleven organizations provide the safety director with a staff. Two companies employ assistant safety directors. Although small in size, the staffs of the safety departments, in addition to the assistant directors, are composed of clerks, stenographers, inspectors, nurses and persons assigned various duties, serving on part time.

Central committee establishes policies

Among the larger companies, central safety committees are frequently organized to assist the management in conducting accident prevention work. These committees usually serve as policy-setting bodies, determining procedure in cases where production and safety appear to conflict, reviewing and passing upon recommendations involving large expenditures, and preparing safety standards and regulations for the guidance of the operating organizations.

Such committees have been organized by fourteen reporting companies. Meeting periods vary from bi-weekly to three-month intervals. Some committees meet only on the call of their chairman. Membership consists largely of heads of the operating organization, such as district superintendents, plant managers and chief engineers. Company officers serve, however, on the committees of some organizations.

Members of the central safety committee are appointed in most of the companies co-operating in this study. The personnel is permanent as to position in five cases; in five others the members serve indefinitely. Three months is the shortest duration of service on the central safety committee, with only two companies reporting this period.

Workmen's committees stimulate safety

Placing a definite responsibility upon certain employees for the prevention of accidents has been found to be one of the most important means of stimulating employee interest in safety. The organization of a workmen's safety committee usually presents a splendid opportunity to delegate this responsibility.

Fifteen companies maintain workmen's safety committees in their plants. In some organizations all departments are represented. In cases where this has proved impractical, those units presenting the greatest hazards are included.

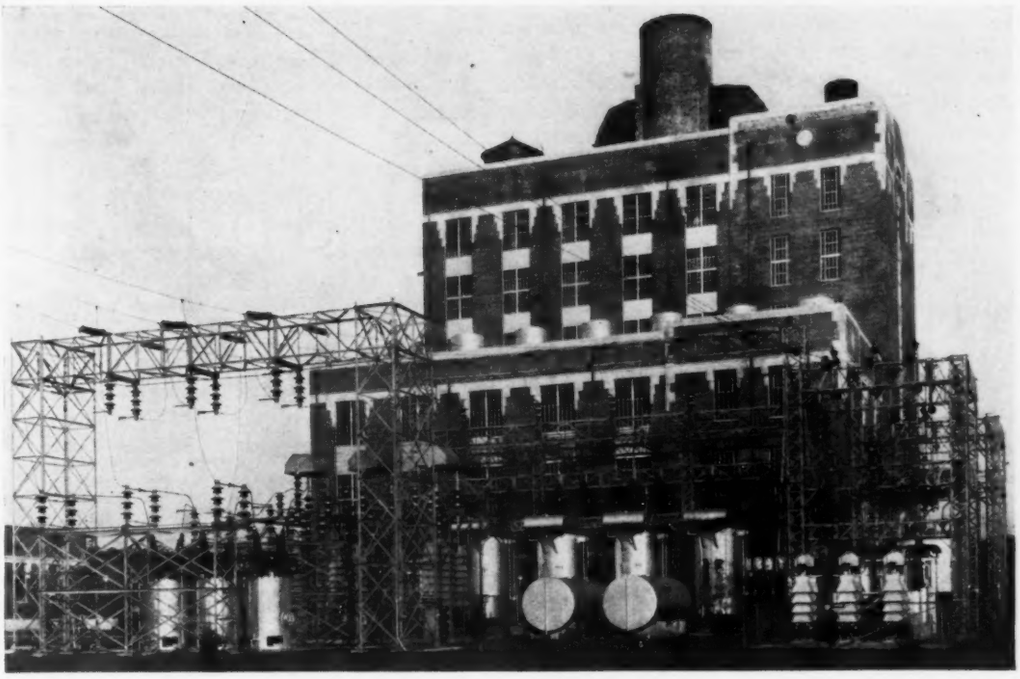
Committees are largely composed of both foremen and workmen, with the latter predominating. Members are usually selected by departmental heads and superintendents to serve for periods ranging from one month to a year. In one utility one-half of the committee is changed at a time, in this manner insuring familiarity with the work on the part of a portion of the membership at all times.

Other observations from this study will be presented periodically.

The Farm Service Job

By S. I. McELHOES
Vice-President Southwestern Light & Power Company

WE ARE driven to the fact that one of our jobs is to build more industry on the farm. In other words, we must encourage the farmer to engage in those things which require the use of electricity. These things are not only necessary in order for him to use electricity but they are necessary in order for him to pay for the use of electricity. The big thought is that our commercial organizations can profitably spend their time in helping the farmer devise ways and means to make more money.



Everything electrical is outdoors at new Gorgas unit

Single-Source Auxiliaries at Gorgas

By

JOHN M. GALLALEE

Consulting Engineer

and

R. M. FERRILL

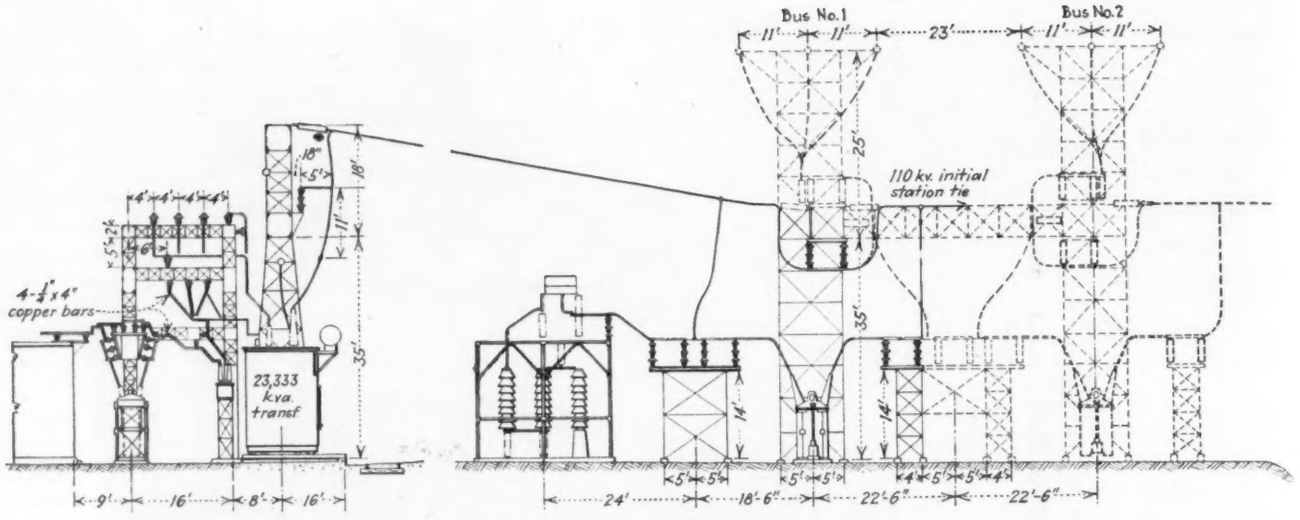
Alabama Power Company

THE Alabama Power Company, in facing the necessity of providing additional capacity at or near the location of its existing 70,000-kw. Gorgas steam station, decided to effect the enlargement in an independent station. The first of the four 60,000-kw. units has been installed in the new station adjacent to the old.*

Adequate transmission lines already radiated from the switching station of the old Gorgas steam plant and suitable switching facilities were already in place there for distribution of the power to be generated by the new unit. It was therefore decided that no new transmission lines would be carried out from the new unit, but that it would merely be connected at 110,000 volts and 44,000 volts to the existing buses in the old station. In order to assure satisfactory division of the load and adequate voltage control it was concluded that voltage regulation would be required between the 110-kv. and 44-kv. lines at the new station. This feature has been provided in a 5 per cent buck-or-boost tap-changing type voltage regulator at the new plant.

The new station will, when it is in operation, be used as a base-load station. However, the existence of the various hydro-electric generating stations, which can be called upon on very short notice for delivery of a large amount of power for a short time, led to the conclusion that the expenditure of any appreciable amount of money to assure against interruptions of a few hours' duration in the new plant would not be justified. Therefore, the general features of electrical design have been controlled more by the necessary safety to personnel and equipment than by assurance against short interruptions. However, it is felt that with the equipment and arrangements provided there will be very few interruptions through electrical failures. Perhaps the most conspicuous evidence of this decision is in the open outdoor 13,200-volt bus arrangement in the connections between the generator

**The steam equipment of the station was described in the April 12 issue of* ELECTRICAL WORLD.



Standard construction and ample clearances characterize the outdoor substation

and the step-up transformers and the fact that the auxiliaries are fed through only one source.

Short-circuit studies were made and it was found that with the installation of the first unit no provision need be made for the control of short-circuit volumes. Provision has been made for the future installation of reactors between the new station and the old station and it is planned that the future 110-kv. switching equipment will have a circuit arrangement such that each generator may feed directly onto two transmission lines and thence to a more or less remote point in the system, thus obviating the need of short-circuit volume control equipment such as would be necessary if the entire four units of the ultimate plant were connected together on the 110-kv. station bus.

The main generator is an 1,800-r.p.m., 60-cycle, 66,667-kva. at 90 per cent power-factor unit, star connected for a terminal potential of 13,800 volts. Excitation is provided normally through a 200-kw., 250-volt, shunt-wound shaft exciter. A similar motor-driven exciter is provided for use in event of failure of the direct-connected exciter. Regulation is through the "quick-response" rheostatic scheme and provision is made for control of either the shaft exciter or spare exciter by this regulation. No main unit field rheostat is used.

Auxiliaries fed from single source

The auxiliary power demands of the unit are supplied by one 9,000-kva., 13,200- to 2,300-volt, three-phase, oil-insulated, water-cooled transformer which is connected on the high side through disconnects to the main bank low-tension delta leads. The 2,300-volt power is conducted through an outdoor oil circuit breaker to selector disconnects, thence through either of two sets of cables to the indoor auxiliary power room. These selector disconnects permit the connection of either group of cables to one of the two auxiliary buses.

The 2,300-volt auxiliary buses are of open construction above the oil circuit breakers, which are remote-control, solenoid-operated 7.5-kv. breakers mounted in concrete cells. Each 2,300-volt motor is fed through an individual breaker which may be connected through interlocked gang-operated disconnecting switches to either of the buses.

PRINCIPAL ELECTRICAL EQUIPMENT AT GORGAS

Switchyard structure (Nashville Bridge Company).
Transformers:
Main (Westinghouse), four, 23,333 kva. each, 115,000/46,000 Y, 13,800 delta volts, single-phase, water-cooled, outdoor type, one used as spare. Regulating (Westinghouse Electric & Manufacturing Company), 40,000 kva., 5 per cent regulation, three-phase, 46-kv. primary line voltage, tap changing under load. Auxiliary (Westinghouse), six, two 9,000 kva. each, 13,800 delta, 2,300 Y volts, three-phase, water-cooled, outdoor type, one used as spare; two 800 kva. each, 2,300 delta, 575 Y volts, three-phase, self-cooled, outdoor type, one used as spare; two 100 kva. each, 575/230/115 volts, single-phase, self-cooled, outdoor type, one used as spare.
100-kv. synchronizing equipment (General Electric), condenser type with vacuum tube amplification.
Oil circuit breakers (General Electric), 13.8 kv. and above; (Westinghouse), 2,300-volt station service auxiliaries.
Disconnecting switches (Delta Star), indoor and outdoor disconnects from 13.8 kv. down through 2,300 volts; (Southern States Equipment Company), outdoor disconnects for 100 kv. and 44 kv.
Lightning arresters (General Electric), three-phase, outdoor type, oxide film arrester, one 46/50 kv., one 110/135 kv.
Carbon circuit breakers (I. T. E.).
Oil purifier (Hydroil Corporation), 500 gal. per hour, centrifugal.
Annunciators (Holtzer Cabot).
Communication system (North Electric Manufacturing Company), type 2, all-relay, automatic exchange, 30 lines, three links.
Direct-current control power storage battery (Electric Storage Battery), 13 Box Manchester, 60 cell, 120 volts.
Motor-generator sets (General Electric), three, each 20 kw., 125 volts, shunt-wound d.c. generator, direct connected to 30-hp., 550-volt, three-phase, 1,800-r.p.m., double squirred-cage induction motor.
Battery charger (General Electric), motor-generator set, 3½ kw., 125 volts, shunt-wound d.c. generator direct connected to 7½-hp., 550-volt, three-phase, 1,800-r.p.m., squirrel-cage induction motor.
Switchboards and control panels (Westinghouse).
2,300 volt and 550-volt motors (General Electric).
550-volt switch and fuse panels (V-V Fittings).
Indoor bus supports (Champion).
Outdoor insulators, bus supports and roof bushing (Ohio Brass).
2,300-volt and 550-volt potheads (G. & W. Electric Specialty Company).
Instrument transformers (Westinghouse).
Turbine room lighting (Holophane), high bay, type 691 AL.; substation lighting (Holophane Glass Company).
Motor control station (Westinghouse).
Machine signal system (Westinghouse).

The smaller motors are supplied through an 800-kva., 2,300- to 550-volt, three-phase, oil-insulated, water-cooled transformer which is fed from the 2,300-volt bus. The 550-volt transformer leads are connected to a bus from which group distribution panels are fed through carbon circuit breakers.

Transfer circuits are provided and so terminated that in event of the failure of the cable leads to any essential motor, or in case of 550-volt motors, the distribution panel may be connected to the transfer feeder in a short space of time.

It is the duty of the main switchboard operator to provide potential on the 2,300-volt and 550-volt auxiliary buses. The individual motor control is always in the hands of the plant operator concerned with the individual equipment, this with the exception of the spare motor-generator exciter, which is under the control of the main switchboard operator.

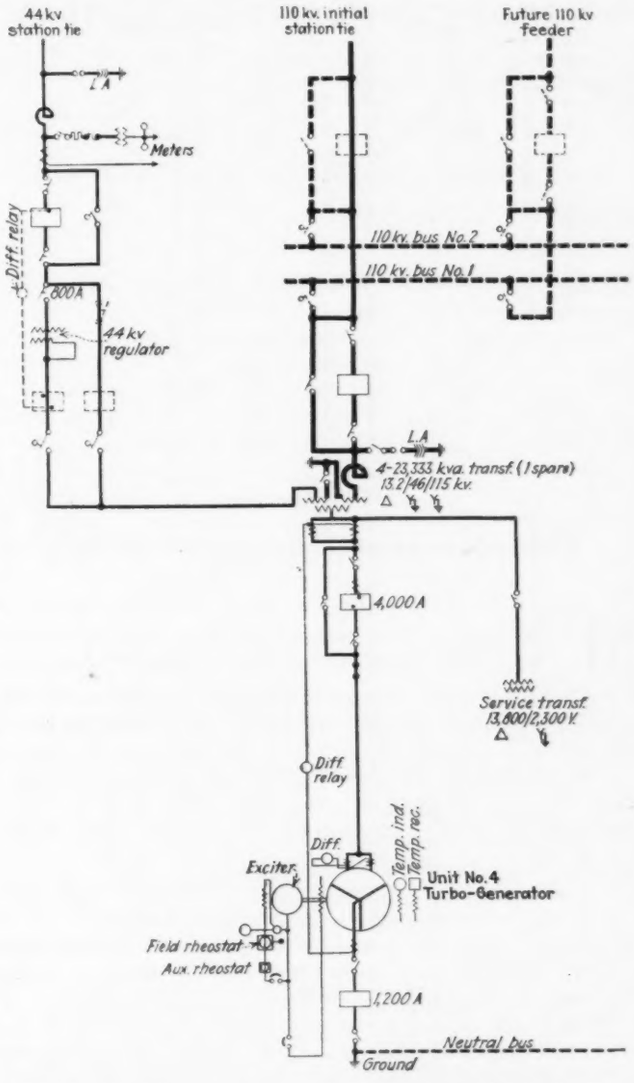
In general, motors of 100 hp. and above are 2,300-volt and below 100 hp. 550-volt. There are installed with the unit 49 550-volt motors and 31 2,300-volt motors varying from 100 hp. to 1,800 hp. All motors are constant-speed, full-voltage starting, with the exception of the skip-hoist motor, which is of the two-speed, pole-changing type; the boiler feed pump, condensate pump and primary air fan motors, which are of the wound-rotor type, and the burner feeder motors, which are direct-current motors controlled by Ward-Leonard scheme of varying armature voltage. All motors are of the 40-deg. temperature rise classification and are provided with moisture, dust and weak acid-resisting insulation. No inclosed motors were used with the exception of those small motors for driving traveling water screens, pulverizer feeders and the above-mentioned burner feeder motors. Split end brackets were provided on the coupling ends of all motors to facilitate bearing replacement and all motor leads are brought out through conduits to provide for junction boxes and, for the 2,300-volt motors, cable potheads.

Across-the-line starters permit full push-button control of auxiliary motors

The general arrangement of auxiliary motor control is such that each motor is controlled from a push-button station mounted near the motor. For the 2,300-volt motors these push-button stations are equipped with stop and start buttons, red and green indicating lamps to indicate the position of the oil circuit breaker feeding the motor and two clear lights to indicate the positions of the oil circuit breaker selector disconnecting switches.

The 550-volt motors are controlled by push-button stations mounted near the motors. These push-button stations operate "across-the-line" type starters which are fed from the group panels. Near each group panel a push-button station with indicating lamps is provided for operating the carbon circuit breaker that feeds the panel. An exception to the above is made in such cases as the boiler auxiliary motors, the pulverizing system motors and the coal-handling motors.

All boiler auxiliary motors are controlled from the boiler operating board, where all indicating and control equipment of the two boilers is centralized and arranged so as to be under the complete control and observation of one operator. Electrical interlocking is provided to protect against explosions or damage through the failure or stoppage of any motor, and an annunciator is provided to indicate the circuit on which any trouble has occurred. The Ward-Leonard control burner feeder motors are under complete control from the boiler board and provision is made for automatic throw-over to the station battery in case of failure of the motor-generator sets which supply power to these motors.



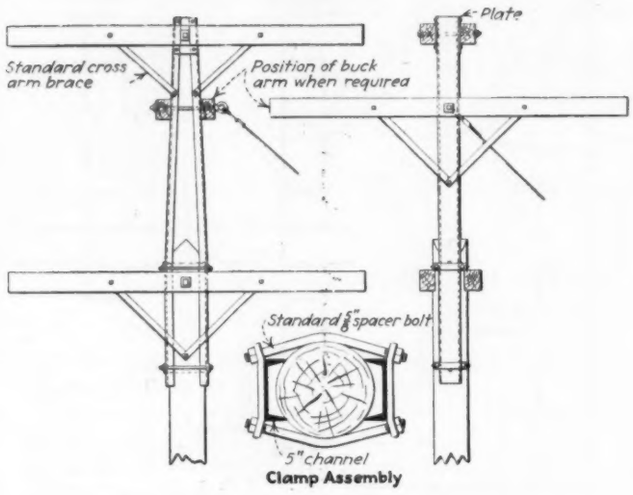
Single, station-service transformer and single-line allocation of generator

The control of the pulverizing system is centralized on one board, from which the process from the crushed coal bunkers to the pulverized coal bin is accomplished. Here interlocking is also provided to assure against damage or delays through the failure of any particular motor or equipment.

The raw coal-handling equipment control is also centralized and interlocked at one station and the provision is such that it is expected that one operator will handle the coal from the track hopper through the skip hoist, Bradford breaker, crusher, magnetic separator and belt conveyor to the crushed coal bunkers.

Steel Pole-Top Extension Minimizes Pole Replacements

By R. J. OWENS
Southeastern Engineering Company, Birmingham, Ala.



Channels make extension without boring

MANY times it is necessary to replace poles to secure a few feet additional height. In case poles are loaded with distribution lines and space is needed at the top for additional crossarms, suitable extensions may save the heavy labor cost of replacing the poles.

The general assembly and details of a steel extension that has proved practical and that looks very well is shown here. The extension consists of two 5-in. structural steel channels 7 ft. x 4 in. long with tie plates and arranged to clamp on top of the pole without boring. The cost of the steel fabricated and galvanized is about $10. In straight-line construction, where the load to be carried is light, one 5-in. channel serves the purpose and costs only about $4.

▼ ▼ ▼

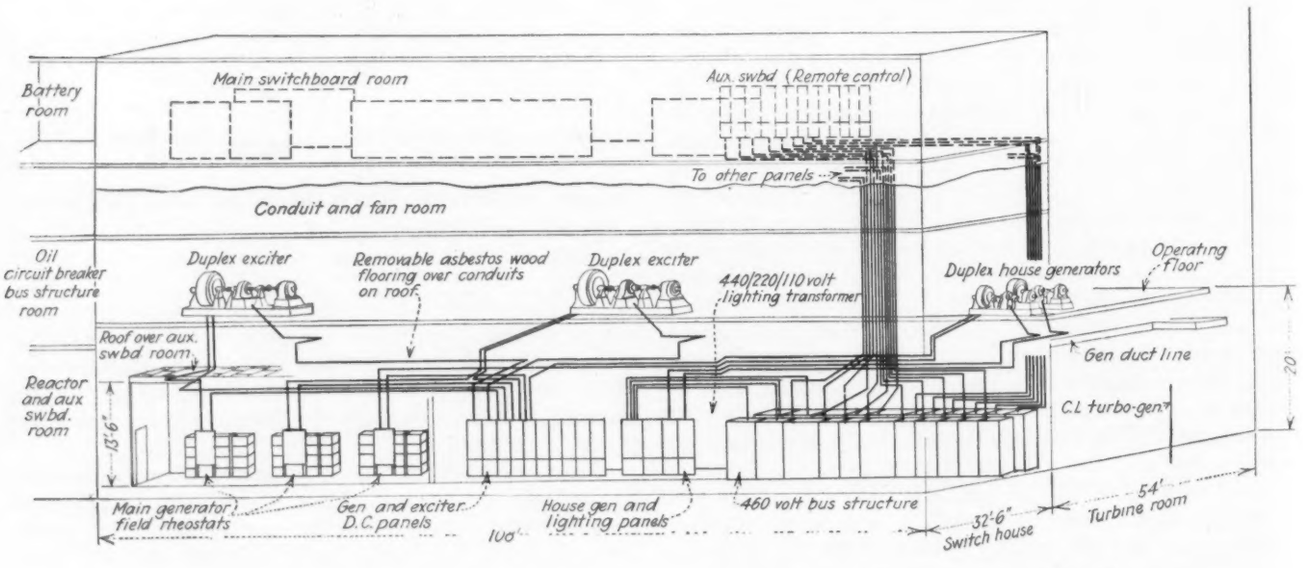
Shortening Control Runs

By A. P. SEELEY
Electrical Engineer Westcott & Mapes, New Haven, Conn.

ESSENTIAL to good power station design are short runs of wiring for generator field control, exciter leads, house generator leads and auxiliary wiring to control switchboards. Together with this is not only the necessity for placing the equipment in desired and compact locations but also the necessity for an installation of the wiring that will be accessible and economical.

The accompanying sketch shows an arrangement of wiring of this design in a four-story switch house. It will be noted that the switchboards on the first floor were inclosed in a separate room and the generator field rheostats were placed adjacent in a room inclosed by wire mesh partitions. A ceiling was installed over both rooms. On the top side of this ceiling wiring in conduit was laid out in runs adjacent to each other. Conduit and wiring was brought down to the switchboards and rheostats as shown. A removable asbestos wood flooring was installed over the conduits. The conduits are thus protected from fire hazard from above and the ceiling protects them from below.

Of further interest is the conduit and fan room on the third floor. Here all the control conduits are run exposed between the main switchboards and the oil circuit breaker structures. Also in this room is the ventilating system for the switchhouse. The ventilating ducts were run on the floor and the control conduits on the ceiling.



Economies in apparatus and structural materials realized through shortened cable runs

Gas or Electric Heat?

for Industrial Processes

IMPARTIAL decisions as to the most economical form of industrial heating service to offer customers of combination gas and electric companies depend in large measure upon the organization and caliber of departmental sales personnel.

IN THIS article an engineer who has specialized in this field for more than a decade outlines the approach essential to the best solution of border-line problems in applications of gas and electricity and shows the type of organization which will eliminate most of the interdepartmental arguments that in the past have bewildered the customer and at times resulted in inferior installations.

By an
INDUSTRIAL HEATING ENGINEER

THE policy of the combination gas and electric company in building up industrial heating load seems to be a subject of never-ending curiosity to the industrial gas engineer and power engineer of the public utility having only one service to offer—gas or electricity. Some of the industrial men of the straight electric or gas companies appear to have become so oversold on either electricity or gas that they can see no use for the other. As a result they do not understand that one supplements the other, and that the rendering of both services by a single concern is in no way incongruous. At meetings of the industrial section of the American Gas Association the combination gas and electric industrial heating engineer feels a little out of place because of the general intolerance toward electricity. It is not so noticeable as it was a few years ago, as now he hears that electric heat is competitive with gas, although as late as three years ago it was not mentioned once in a two-day session. At industrial heating meetings of the National Electric Light Association he smells of gas and may hear that the progress of industrial electric heating is being seriously retarded by the alleged policies of the combination companies, which in the opinion of the electric man always favor gas, and to the eye of the gas man, electricity.

This general attitude has developed as a result of the blind propaganda of both the electric and gas men who have oversold themselves in an attempt to set up their single product as the universal source of heat for industrial use. With the growing realization that a source of heat best suited to one operation may not fit another; that the selection should be made only on the economic basis of over-all cost, and that an uneconomical application will invariably be followed by the loss of the heating load to the source of heat resulting in the lowest over-all cost, we may eventually expect a more common-sense attitude in the promotion of industrial heating sales by the straight gas and electric companies. Possibly the policy of the combination company will assist in broadening the viewpoint of both industries.

Customer's welfare paramount

The fundamental basis of a sound industrial heating policy is consideration of the welfare of the customer, as shown by the over-all cost of his finished product with the various sources of heat. This fundamental applies not only to the combination company but also to the gas or electric company. The customer of the combination company should have complete freedom in making his choice between electricity and gas and complete technical information for either service should be made available to him if he wishes it. If he is a large consumer of electricity but uses little gas, it should be pointed out to him that the heating application will earn a proportionately lower marginal electric rate than the marginal gas rate, or vice versa. If he desires it, comparative estimates of over-all costs should be prepared, allowing for the intangible advantages of both electricity and gas.

In the combination company having the welfare of the customer as the fundamental basis of its industrial heating policy, much wasteful competition is avoided. The industrial gas engineer does not sit up nights devising means to get unsound gas business away from his associate, the power engineer. They meet on the common economic ground of consideration of the interests of the customer as shown by over-all cost. There is plenty of business for both electricity and gas, so why waste their time and the customer's time and money in promoting an unsound application. With such an understanding, competition arises generally only under two circumstances:

1. Boundary line applications; i.e., processes where the

over-all costs of the finished product under the prevailing local conditions are about the same with either electricity or gas.

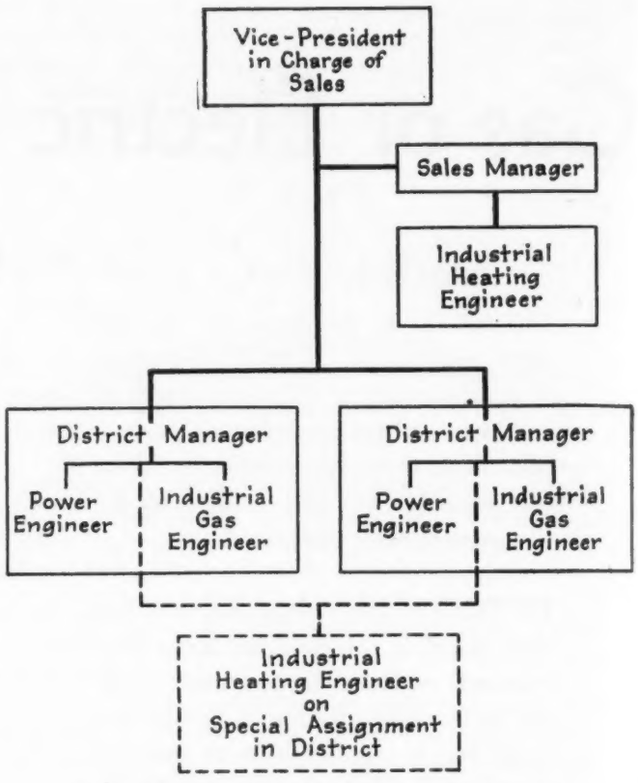
2. Where there is an honest difference of opinion.

For boundary line applications and difference of opinion, there must be a court of appeal, preferably an industrial heating engineer, familiar with the economic side of both gas and electric heating and having a broad knowledge of industrial processes. On boundary line jobs he need make no recommendation. Let the customer decide, but be certain that the customer has complete and accurate information on the over-all cost of using both electricity and gas. In such cases it is best for the industrial heating engineer to conduct the negotiation with the customer rather than have both the industrial gas engineer and power engineer negotiating. Differences of opinion between the gas and electric departments should not be aired before the customer.

On the great majority of negotiations in a territory of diversified industries there is little conflict between gas and electricity. There is a fairly well-defined line between the two in most situations, so that it is very seldom that the industrial gas engineer and power engineer are both interested in the same application, if they have considered it from the basis of over-all cost and welfare of customer.

Cases arise where the customer already has electric service but no gas service is available in the locality, and he thinks it desirable to use gas. Both sides should be presented, and if he still prefers gas, let him have it, but only on the basis of its being profitable business when the cost of the extension is included. If it is unprofitable business due to the cost of the extension, the customer should pay the cost of the extension or guarantee a suitable annual revenue to the company.

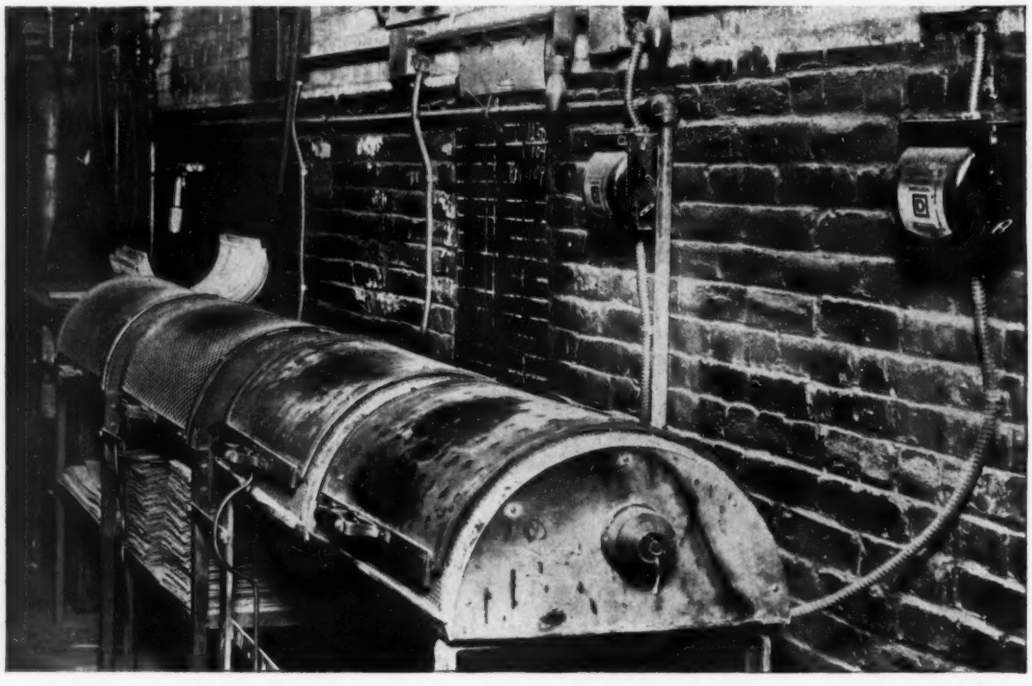
Some manufacturers have a persistent leaning toward a single source of heat, so much so that the favored heat may be considered for about every process in the plant.



Centralized responsibility clears the way for sound decisions

If his leaning is toward electricity when it is apparent that gas or oil are cheaper, and that the use of electricity will increase his over-all cost materially, he should be told the facts. Knowing the facts, the responsibility rests on him, not on the company.

A plan of organization which has proved sound in

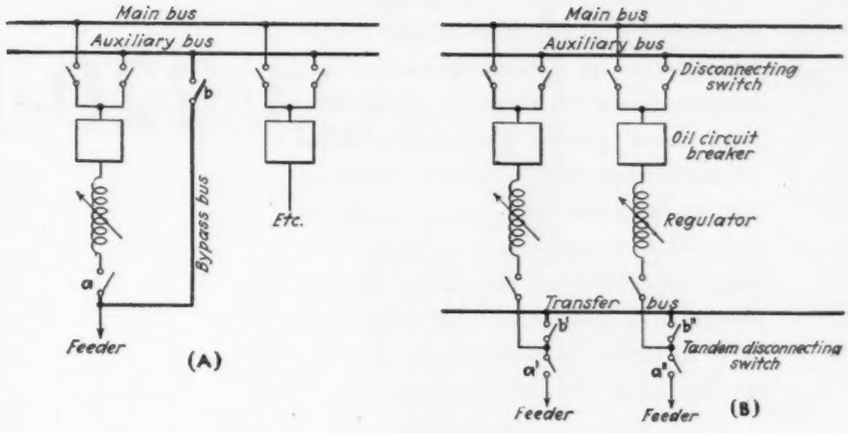


Electrically heated scorchers in printing plant

Material requirements reduced by planned construction

one combination company is shown in the chart. Under this plan the district manager is entirely responsible for sales and public relations, operation and accounting in his district, being directly responsible to the vice-president in charge of each activity. The vice-president in charge of sales has on his staff in the general office an industrial heating engineer responsible for planning industrial heating activities, both electric and gas. In the district there is a power engineer and an industrial heating engineer, each responsible to the district manager. They negotiate for new business along the general line planned by the industrial heating engineer, who presents his plan to them through the district manager. The industrial heating engineer in the general office plans and the engineers in the district execute plans. The industrial heating engineer also actively assists on important negotiations, in which case he is responsible to and working for the manager of the district where the customer is located. He is also the court of appeals in case of controversy over the relative merits of gas and electricity for any application.

The policy and plan of organization outlined has proved very successful in one combination company. The industrial gas engineer and power engineer work together very harmoniously, so that the applications on which the policy is settled by the industrial heating engineer seldom exceed two or three yearly, with several hundred negotiations per year. During the past four years industrial gas sales in thousand cubic feet have increased 83 per cent and industrial electric heating sales in kilowatt-hours 51 per cent, with an increase in annual revenue from industrial heating sales of $433,000, of which increase $126,000 was gas and $307,000 electric.



Tandem Disconnects Reduce Bus Material

JUDICIOUS selection of electrical equipment and arrangement of essential parts can prove economical in many construction jobs. In a recent substation project a saving of 21 ft. in busbar length per three-phase feeder circuit was attained by the use of tandem-operated disconnecting switches and a transfer bus setup as compared with the employment of a bypass bus around the feeder regulator. In the accompanying illustration scheme A provides a bypass bus 10 ft. long per phase to energize the feeder from the auxiliary bus above when the breaker and regulator are disconnected. Normally, the disconnecting switch *a* is closed, energizing the bypass bus as well as the feeder. Scheme B does away with the bypass bus connection, with the substitution of a tandem-operated disconnect for each phase and requiring but 3 ft. of bus per phase or 9 ft. of copper bus material per feeder. Normally, the disconnecting switch *a'* is closed, energizing the feeder from either the main or the auxiliary bus. The switch blade *b'* is normally open, leaving the transfer bus dead and thus increasing the operating safety of the installation. The arrangement is used in 2,300- to 4,600-volt construction.

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Swiss Extend Appliances 15 per Cent in Year

The substantial increase of domestic appliance sales during 1928 is due largely to the propaganda of the various Swiss works, which combined for this special purpose.

	Connected at End of 1927		Connected During 1928		Connected at End of 1928	
	Number	Kw.	Number	Kw.	Number	Kw.
Ranges, cookers, boiling plates	108,000	208,500	15,600	55,100	123,600	263,600
Kettles, teapots, percolators	163,000	69,080	13,000	5,150	176,000	74,230
Toasters	33,000	12,830	2,300	1,090	35,300	13,920
Irons	556,000	229,600	47,000	20,500	603,000	250,100
Fires and heaters	198,500	246,200	31,000	33,600	229,500	279,800
Hot water storage tanks	52,000	83,000	17,400	20,800	69,400	103,800
Bake ovens, pastry ovens	350	9,700	30	300	380	10,000
Boilers	520	3,080	90	570	620	3,650
Warming and drying cupboards	6,610	5,500	70	170	6,680	5,670
Fodder boilers for cattle	1,210	2,610	480	1,030	1,690	3,640
Various other appliances	43,810	62,900	3,550	3,490	47,470	66,590
Totals	1,163,000	933,000	130,520	141,800	1,293,640	1,074,800

220-Kv. Tests on

By L. W. DYER

Circuit Breaker Engineering Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

THE problem of switching high-voltage circuits under short-circuit conditions with oil circuit breakers has become more involved as power systems have grown and transmission voltages have risen. System interconnection and the intricate networks of individual companies spreading over large areas subject to various atmospheric conditions have put a demand upon switching equipment that is becoming more difficult to meet.

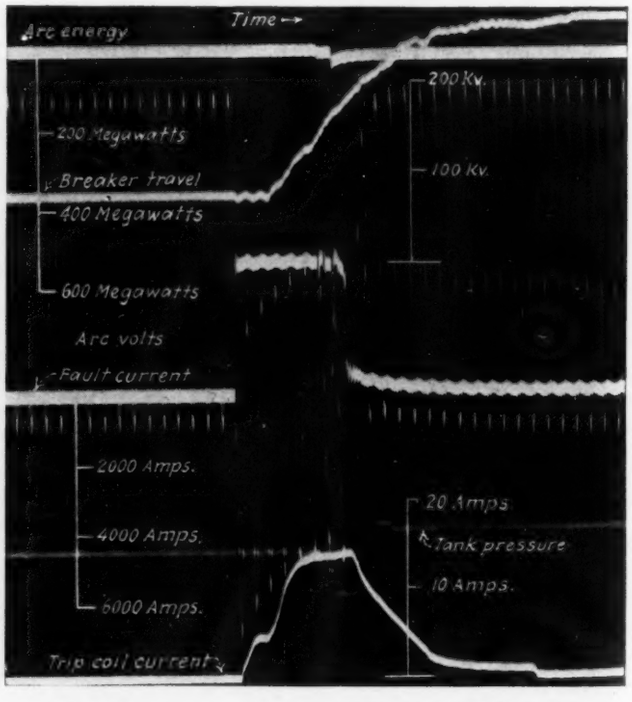
INTERCONNECTION of hydro-electric and steam-operated power plants usually located miles apart and connected by high-voltage overhead transmission lines have added problems in system stability requiring circuit breaker performance unheard of several years ago. The conventional oil circuit breaker has been successful in meeting these conditions, has given a very creditable performance and has kept pace with improvements in other major apparatus.

FIELD TESTS of "Deion grid" breakers at 66 kv. and 110 kv. were described and results presented in the April 19 issue of ELECTRICAL WORLD. Data and oscillograms on line-to-ground, line-to-line and three-phase tests, chiefly OCO duty cycles, were included. Among the figures shown for 42 tests were amperes interrupted, relay time and the duration of short circuit, and arcing. In one 110-kv OCO test, involving a line-to-line short circuit equivalent to 1,117,000 kva. (three-phase), the duration of the short circuit was 8 cycles and the arcing time 1.5 cycles.

In this current article field tests at 220 kv. are described and results given.

In order to test the "Deion grids" on a 220-kv. system using a breaker which would give high-speed operation, arrangements were made with the Philadelphia Electric Company to conduct a series of tests on its 220-kv. system at Plymouth Meeting substation. This company operates one of the largest 220-kv. systems in the East, it being a combination of steam and hydro-electric generation. The hydro-electric generating station at Conowingo is connected by 60 miles of transmission line to steam stations in the vicinity of Philadelphia. The system set-up for these tests was unique in the history of oil circuit breaker tests, in that a maximum of approximately 500,000 kw. of synchronous equipment was segregated from the load and maintained as a special test circuit. A further feature of the test was the use of a 48-mile open-end transmission line connected to the circuit at the test breaker. The system set-up, with the exception of one additional generator at Conowingo, is given by Mr. Lewison in an article published October 12, 1929, in the ELECTRICAL WORLD.

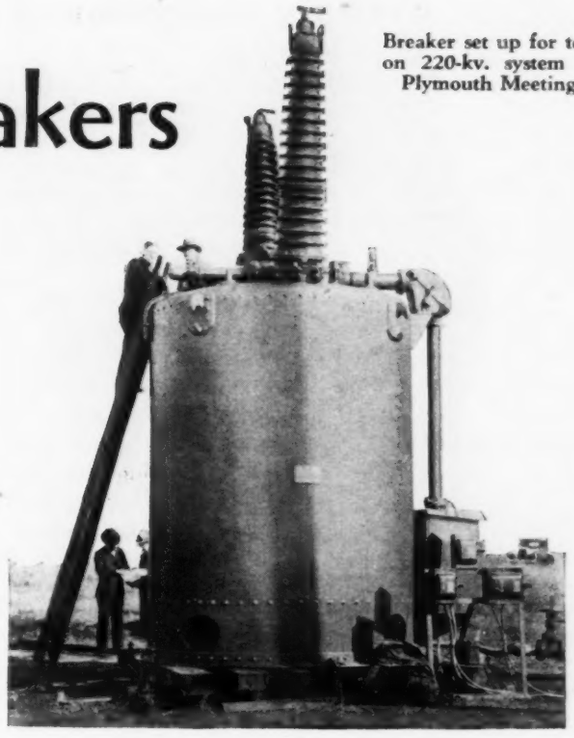
A Westinghouse type "G-22-S" single-pole breaker similar to those in use at the Conowingo hydro-electric power station was used for the tests, with the exception of the "Deion grid" feature. The breaker was operated with a standard 6-in. full-automatic mechanism, an exact duplicate of those used on the conventional oil circuit breaker. No special accelerating device was used in the breaker except a slightly heavier spring. A few minor changes in levers and dashpot details were also used to compensate for the added acceleration. The contact speed was approximately 14 ft. per second. The breaker is shown as set up for test. A Westinghouse special



Oscillogram of a line-to-ground, CO-duty cycle test on 220-kv. system at Plymouth Meeting

Current interrupted 2,900 amp.

Deïon Grid Breakers



Breaker set up for test on 220-kv. system at Plymouth Meeting

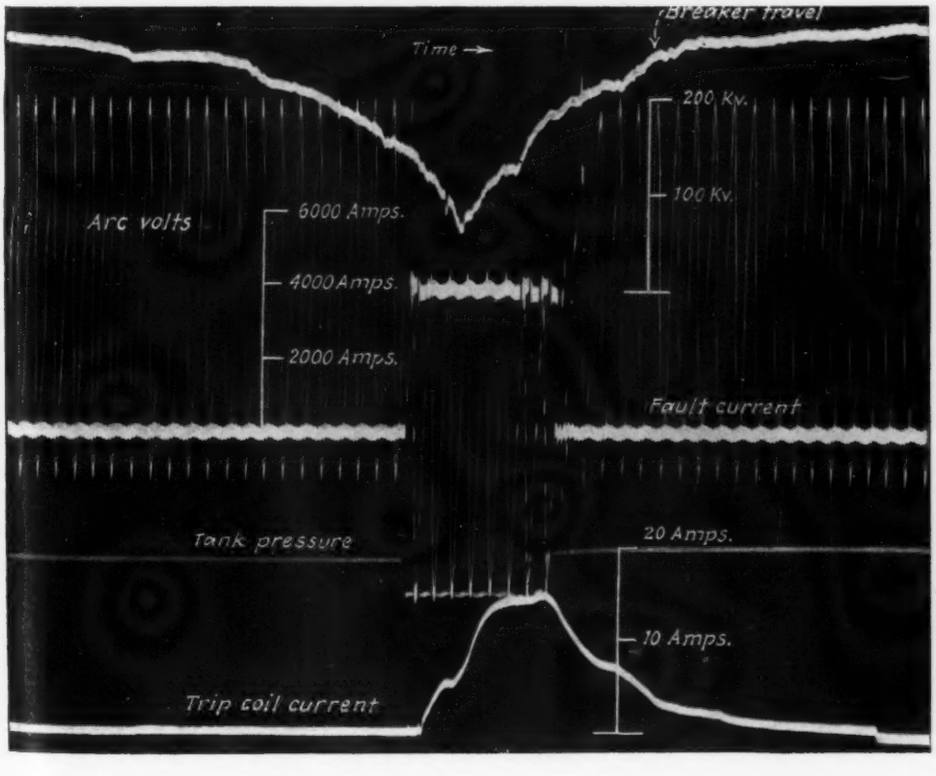
high-speed relay was used for detecting the fault and energizing the trip coil of the breaker. This relay was the latest development in fault-detecting apparatus and operated in a minimum time of 0.003 second.

The majority of tests were made line-to-ground, as this represented the condition under which the greater number of faults occurred. Current values of 1,100, 2,200 and 3,000 amp. were obtained on line-to-ground faults, while 2,200 amp. was the approximate current value on the line-to-line tests.

On November 10 twelve CO, line-to-ground tests with currents varying from 1,100 to 2,900 amp. and four OCO, line-to-ground tests at 2,900 amp. were made. The breaker showed no indication whatever of distress, threw no oil or jumped on its foundation. On each test a slight puff of smoke was visible at the exhaust, which was the only indication of interrupting power. The twelve tests were made in less than two hours. The average short-circuit time for the sixteen tests was 8.53 cycles, including relay time. Deducting this time gives 7.56 cycles for the complete breaker operation, from energizing the trip coil to extinction of the arc. The arcing time averaged 2.84 cycles, with a minimum of 2 and a maximum of 4.5 cycles. The four CO tests at 2,800 amp. are interesting, in that 7.5 cycles was the duration of the short circuit for each test and the net breaker time averaged 7.2 cycles. Table IV gives the detailed results of these tests.

In order to obtain information for future high-voltage breakers four CO tests and one OCO test were made with 220 kv. across a single pole. The breaker cleared the four CO short circuits without distress, but showed signs of additional arcing on the OCO operation. The short circuit was, however, cleared by the test breaker. The tests were concluded at this point and the contacts inspected. The "Deïon grid" contacts were in perfect condition, showing very little indication of interrupting these short circuits. The distress indicated on the last OCO test was due to a flashover from the upper terminals to the moving cross-bar, caused by insufficient insulation for this voltage on the upper terminal. Operating as a plain break switch, no damage was done to the "Deïon grids."

An oscillogram is shown of a typical line-to-ground



Oscillogram of a line-to-ground, OCO-duty cycle on 220-kv. system at Plymouth Meeting

Current interrupted 2,950 amp.

TABLE IV—LINE-TO-GROUND TESTS ON 220-KV., 60-CYCLE SYSTEM

Plymouth Meeting, Philadelphia Electric Company, Philadelphia, Pa., November 10, 1929

Westinghouse Type "G-22-S" "Deion grid" Oil Circuit Breaker

Test No.	Duty cycle	Short circuit	Duration of Short circuit, cycles	Relay time, cycles	Net breaker time, cycles	Arcing time, cycles	Amperes interrupted
1	CO	Solid ground	9.0	1.5	7.5	2.5	1,130
2	CO	Solid ground	9.5	1.25	8.25	3.5	1,100
3	CO	Solid ground	8.0	0.4	7.6	2.0	1,110
4	CO	Solid ground	10.5	2.1	8.4	3.5	1,060
5	CO	Solid ground	10.0	0.35	9.65	4.5	1,890
6	CO	Solid ground	8.0	0.40	7.60	2.5	2,030
7	CO	Arcing ground	8.0	0.48	7.52	2.5	2,060
8	CO	Arcing ground	7.5	0.48	7.02	2.0	2,000
9	CO	Solid ground	7.5	0.30	7.20	2.5	2,900
10	CO	Solid ground	7.5	0.30	7.20	2.5	2,840
11	CO	Arcing ground	7.5	0.40	7.10	2.5	2,890
12	CO	Arcing ground	7.5	0.20	7.30	2.5	2,820
13	OCO	Solid ground	9.0	2.2	6.80	3.0	2,950
14	OCO	Solid ground	8.0	0.92	7.08	3.0	2,950
15	OCO	Arcing ground	9.0	1.70	7.30	3.0	2,940
16	OCO	Arcing ground	10.0	2.50	7.50	3.5	2,920

CO test interrupting 2,900 amp. The total duration of short circuit is 7.5 cycles, while the arcing time is 2.5 cycles. The breaker travel indicator record shows the movement of the mechanical pull rod. The position of the contacts, therefore, must be interpolated from this record. On this test the contacts were approximately one-fourth open when the circuit was interrupted. The oscillation in the current zero line is charging current on the open end transmission line.

A typical OCO test is given that interrupted 2,950 amp., line-to-ground. This oscillogram shows one cycle of arcing on the closing operation as the voltage causes breakdown before the contacts touch. The record of trip current shows a delayed relay operation on this test.

The dielectric test of the oil before the tests was 28.2 and 27.3 kv. for two samples, while at the conclusion of the tests it was 24 and 25.6 kv. The slight oil deterioration is a measure of the efficiency of the arc-interrupting medium. The line-to-ground tests demonstrated the efficiency of the "Deion grids" for application to high-speed breakers. The line-to-line tests, while not entirely satisfactory, gave every indication of being suitable for this high-voltage service with slight modifications. The performance was highly gratifying, in view of the fact that this was the first attempt to interrupt a 220-kv. circuit with a single-pole breaker, with an entirely new method of arc interruption.

Through the co-operation of the Philadelphia Electric Company, tests were again made with a slightly modified device on November 17. This series of eight CO and four OCO tests, line-to-ground, with currents varying from 1,100 to 3,300 amp., followed by one CO test, line-to-line, at 2,200 amp., resulted in improved performance on the line-to-ground tests. The one line-to-line test was not satisfactory, failing in a similar manner as the test on November 10. The results of the line-to-line experimental tests are shown in Table V.

This test indicated that a more extensive modification of the "Deion grids" was necessary for interrupting 220,000 volts on a single-pole breaker. It was the opinion of the engineers connected with this development that a new "Deion grid" could be designed which would interrupt this circuit successfully. The Philadelphia Electric Company was agreeable to conducting another set of tests, being desirous of extending its facilities for the purpose. In accordance with the information gained through these tests a new set of "Deion grids" was designed and tests again made on December 1. The "Deion grid" used on this series of tests is shown in an accompanying illustration.

In order not to overlook the performance of this new design on line-to-ground tests the program of shots included sixteen line-to-ground tests before the line-to-line tests were made. The breaker opened twelve CO line-to-ground tests, four being made at current values of 1,100, 2,200 and 3,300 amp. and four OCO tests at 3,300 amp., with no sign of distress of any nature. A slight puff of smoke appeared at the exhaust on each test. Seven line-to-line tests then followed, four of which were CO and three OCO at 2,200 amp.

The breaker interrupted six of these 220,000-volt short circuits successfully, with only a slight increase in the amount of smoke issuing from the exhaust. On the seventh test it appeared from observation that a larger quantity of smoke was ejected through the exhaust, along with about a quart of oil. This indicated

TABLES V AND VI—LINE-TO-LINE TESTS ON 220-KV., 60-CYCLE SYSTEM

Plymouth Meeting Station, Philadelphia Electric Company, Philadelphia, Pa.

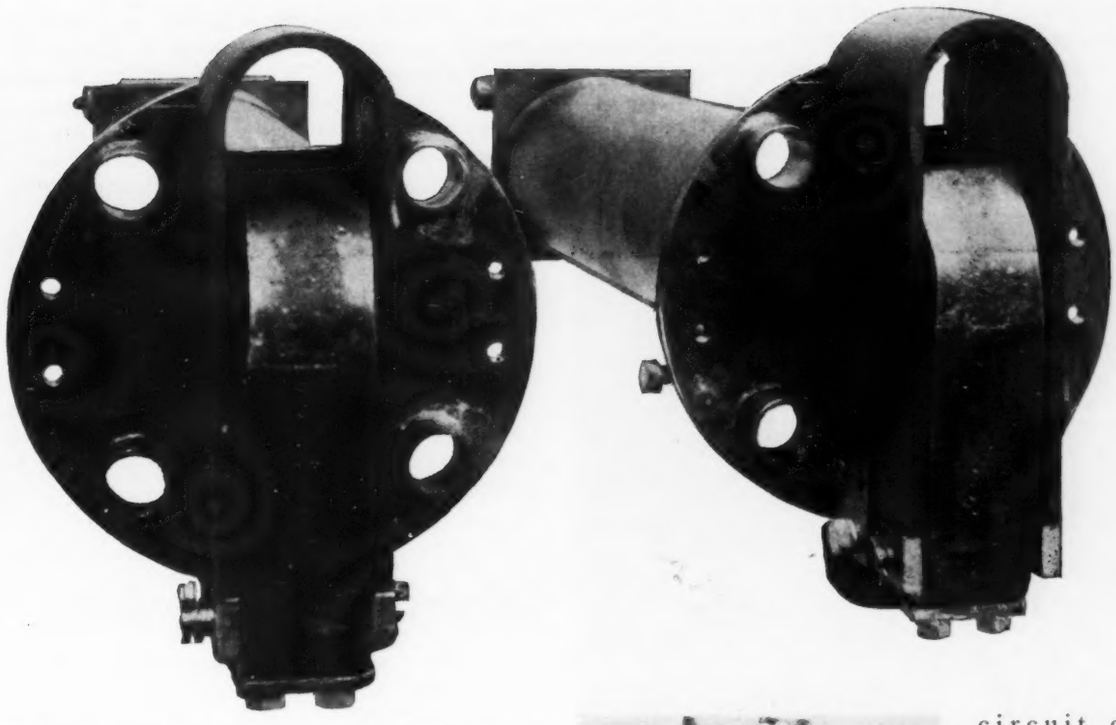
Westinghouse Type "G-22-S" "Deion grid" Oil Circuit Breaker. Tests Made With 220,000 Volts Across a Single-Pole Breaker

November 10 and 17, 1929—Experimental "Deion Grids"

Test No.	Duty cycle	Duration of short circuit, cycles	Relay time, cycles	Net breaker time, cycles	Arcing time, cycles	Amperes interrupted
17	CO	8.5	0.32	8.18	3.0	2,130
18	CO	13.5	2.00	11.50	6.5	2,070
19	CO	16.5	0.43	16.07	11.0	2,130
20	CO	10.0	0.46	9.54	4.5	2,100
21	OCO	20.0	1.16	18.84	14.0	2,100
34	OCO	Back-up breaker cleared short circuit.				

December 1, 1929—Modified "Deion grids," Designed for 330,000-Volt Grounded Systems

Test No.	Duty cycle	Duration of short circuit, cycles	Relay time, cycles	Net breaker time, cycles	Arcing time, cycles	Amperes Interrupted
51	CO	12.5	0.42	12.08	7.0	2,160
52	CO	12.5	0.22	12.28	7.0	2,200
53	CO	13.0	0.26	12.24	7.5	2,140
54	CO	12.0	0.47	11.53	6.5	2,140
55	OCO	18.0	4.5	13.50	8.0	2,100
56	OCO	16.0	3.2	12.8	6.5	2,100
57	OCO	21.0	3.0	18.2	10.5	2,100



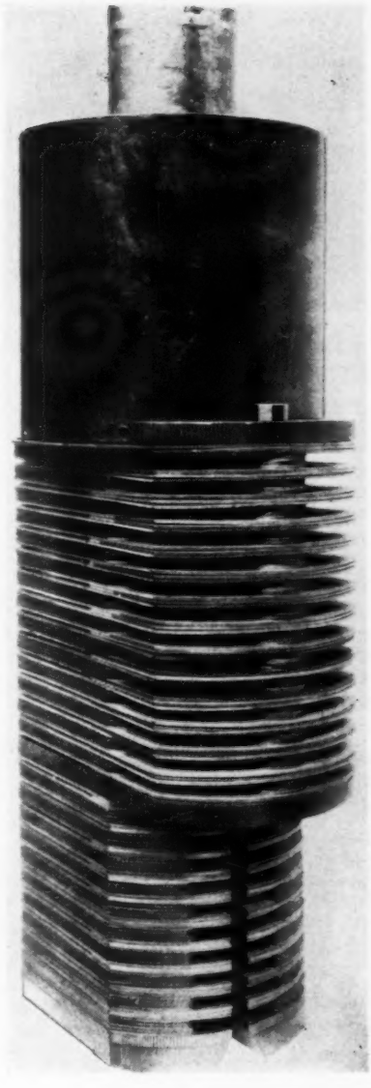
Stationary contacts after tests at Plymouth Meeting on December 1, 1929

This set of contacts opened 23 short circuits, sixteen line-to-ground and seven line-to-line tests on a 220-kv. system, the current values varying from 1,145 to 3,220 amp.

that the circuit was not cleared as successfully as on the previous tests. It was desirable to inspect the record of this test before continuing to the final scheduled test. Examination of the oscillogram showed the test breaker interrupted the circuit, but took slightly longer than on the previous test. Due to the late hour and the fact that the power company was desirous of using the segregated system for load demands, it was decided to dispense with the last test as it was felt no further information could be gained.

The results of the last series of line-to-line tests are shown by Table VI. This group of tests reveals that a decided improvement in operation and consistency in performance was obtained by the improved "Deïon grid." It should be kept in mind when reviewing these tests that sixteen line-to-line ground tests were made previous to these line-to-line tests, and that the 220-kv. tests were made without inspection of the "Deïon grids" or changing oil.

Inspection of the oscillogram of test No. 57 showed a rather remarkable performance, in that the breaker cleared two independent short circuits. The initial short-circuit duration was 13 cycles and was interrupted with 4 cycles of arcing. The flow of current was interrupted for 1½ cycles when a reignition of the arc occurred. This second short circuit persisted for 6½ cycles, at which time the circuit was again interrupted. The first short circuit was evidently interrupted with such a short separation of the contacts that the intervening space was unable to prevent reignition during the unstable period immediately following quenching of the arc, and the second short circuit occurred, which was duly interrupted in a space which had previously cleared the circuit.



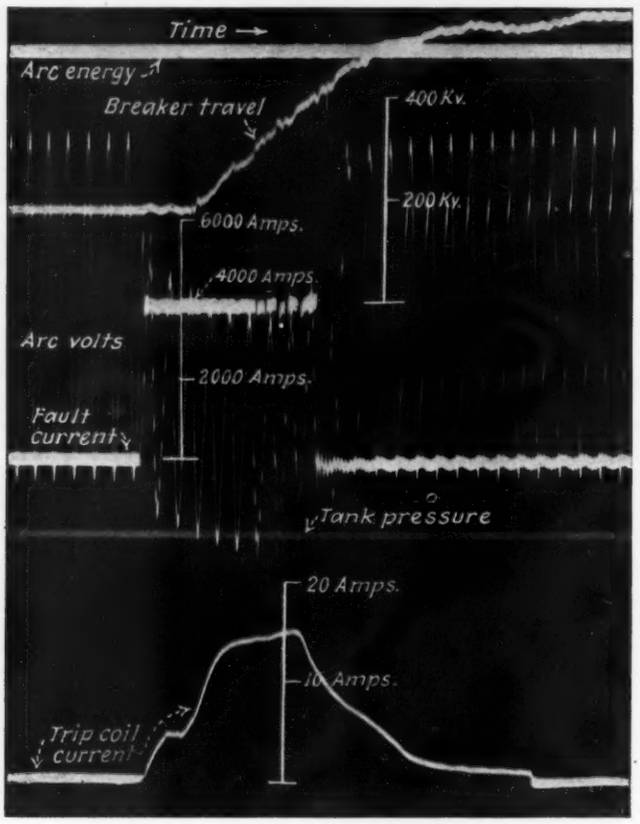
"Deïon grid" used in tests December 1, 1929, at Plymouth Meeting

Examination of the "Deïon grids" revealed no damage or deterioration and they were capable of continuation of the tests, had that been desirable. Voltage breakdown tests were made on these "Deïon grid" stacks after the tests and each unit stood a test of 300 kv. in oil across the ends for one minute.

An oscillogram is shown of an exceptional line-to-line

test interrupting 2,130 amp. at 220,000 volts. This test shows the possibilities of the "Deion grid" oil circuit breaker for use on 330-kv. grounded systems.

Before the last series of 23 tests two oil samples gave an average dielectric strength of 24 kv., after the tests two samples tested 28.9 kv. It is hardly possible that



Oscillogram of a line-to-line, CO-duty cycle test, interrupting 2,130 amp. at 220,000 volts

the interruption of 23 short circuits on this tank of oil improved its dielectric strength, but this fact is significant, in that it shows the efficiency of the "Deion grids" and what can be expected in oil deterioration with their use.

The stationary contacts used on the tests on December 1 are shown in an accompanying illustration. This set of contacts has interrupted 23 short circuits, the currents varying from 1,100 to 3,300 amp. The illustration shows clearly how the arc travels on the horn-shaped contacts.

This extensive program of field tests demonstrated that the "Deion grid" oil circuit breaker is a major improvement in the art of opening high-voltage circuits under short-circuit conditions. The improved arc-interrupting medium is so efficiently used that the arcing time in breaker operation is no longer the principal factor involved in over-all time of circuit-breaker operation.

System stability problems can be easily met with the "Deion grid" breaker, as was demonstrated by the tests at Plymouth Meeting. With the use of this device consistent interruption of high-voltage circuits can be made in 10 to 12 cycles of short-circuit current with the mechanical design now supplied on breakers for this class of service. Interruption in 7 to 8 cycles of short-circuit current is quite feasible with a moderate increase in cost. A still shorter time is within the range of this device, and if conditions warrant and economies permit, higher speed breakers can be built, although this requires careful design and high-grade material, which necessarily increases the cost.

Maintenance problems are reduced to a minimum, as oil deterioration is a negligible quantity and the simple contacts are not subject to mechanical difficulties.

The report of these field tests would not be complete without a word of appreciation for the hearty co-operation extended by the Duquesne Light Company, the Alabama Power Company and the Philadelphia Electric Company, without whose aid the rapid development of the "Deion grid" oil circuit breaker would have been impossible.

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Efficiencies in Decibels

By J. O. PERRINE
American Telephone & Telegraph Company

IN TELEPHONE transmission the yardstick "per cent" efficiency is not used as such, but a lump amount of per cent is used and given the name decibel (DB), or transmission unit (TU).

The question naturally arises, "What per cent efficiency is 1 DB?" The answer is, "1 DB efficiency is equal to 79 per cent." If 79 per cent of the electric power put in at a certain point in a telephone circuit arrives at some other point, that particular circuit would be 79 per cent efficient, or 1 DB efficient in telephone parlance. However, when vacuum tube repeaters are placed in a circuit, power is added.

To differentiate the two cases, one could say the circuit is —1 DB efficient when the output is 79 per cent of the input, as a result of a loss in power. When the input is 79 per cent of the output, as a result of am-

How Efficiencies in DB's Compare with Percentages

Efficiency			Efficiency		
DB or TU Loss	Per Cent		DB or TU Gain	Per Cent	
½	89.1		½	112	
1	79.4		1	126	
2	63.1		2	158	
3	50.1		3	200	
4	39.8		4	251	
5	31.6		5	316	
6	25.1		6	398	
7	20.0		7	501	
8	15.8	Re-	8	631	Amplifi-
9	12.6	duction	9	794	cation
10	10.	0.1	10	1,000	10
20	1.	0.01	20	10,000	100
30	0.1	0.001	30	100,000	1,000
40	0.01	0.0001	40	1,000,000	10,000
50	0.001	0.00001	50	10,000,000	100,000

15 DB does not appear in the above table. However, by simple calculation its equivalent percentage can be found, thus:

15 DB Loss = 10 DB + 5 DB = 10 per cent × 31.6 per cent = 3.16 per cent or

8 DB + 7 DB = 15.8 per cent × 20 per cent = 3.16 per cent.

plification, one could say that the circuit is 1 DB efficient. Now it is to be noted that when the circuit is 1 DB efficient, the input being 79 per cent of the output, the output is, on the other hand, 126 per cent of the input. 126 per cent $= \frac{1}{79}$ per cent.

To conserve time and space, the symbols minus and plus and the words "efficient," "79 per cent" and "126 per cent" are omitted and the terse expressions 1 DB loss, 1 DB gain are used to give the same information.

If a particular piece of telephone apparatus is 63 per cent efficient, namely, 79 per cent times 79 per cent, the telephone man says there has been a loss of 2 DB's. Here the 2 indicates the number of times 79 per cent is to be used as a term in multiplication. So 79 per cent times 79 per cent times 79 per cent, giving 50 per cent efficiency, would be a 3 DB loss. If there is an 8 DB gain 126 per cent must be used 8 times in multiplication; for a 25 DB gain, 25 times.

Consider a telephone cable 250 miles in length. It has an efficiency of 70 DB's. To find the per cent of voice power transmitted by this cable circuit one might use 79 per cent 70 times, as a term in multiplication, resulting in an efficiency of one one-hundred-thousandth of a per cent (0.00001 per cent). The telephone man, entirely on the basis of familiarity with the terms concerned, remarks, "I choose to say that there has been a 70 DB loss." Of course, when such a cable is used for voice communication, such a low efficiency is offset by use of telephone repeaters located at intervals along the route which add new power to the voice currents. The name decibel (DB) has been officially adopted within the Bell System instead of the name transmission unit (TU), and so will gradually replace it. The first syllable of the word decibel means one-tenth; the last syllable comes from the name of Bell, inventor of the telephone.

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Connected Load Ratios Vary Widely

HOW does the motor horsepower in various industries compare with the rating of generators or transformers through which they get their energy? Industries using power continuously and steadily permit of a much smaller connected motor rating per 100 kw. of generator than those with intermittent loads. Textiles have less than 100 motor hp.; metal-working processes may run two or three times as high.

The table here presented was computed from the reports of the 1927 Census of Manufactures. The names of industries have been condensed.

Aside from providing a basis for estimating generator or transformer equipment to carry a given industrial motor load it gives a clue to the probable use-factor of the latter. A similar table for industry groups appeared in the ELECTRICAL WORLD of February 15, 1930, on page 341.

RELATION BETWEEN MOTOR AND GENERATOR RATING, BY INDUSTRIES IN ESTABLISHMENTS REPORTING 10,000 HP. OR OVER—CENSUS OF MANUFACTURES, 1927

Industries	Motor Horsepower per 100 Kw.
Agricultural implements	142
Aluminum manufacturing	251
Asbestos products	203
Beverages	118
Bolts, nuts, washers and rivets	137
Boots and shoes, other than rubber	120
Boxes, paper and other	134
Boxes, wooden	122
Brass, bronze	190
Bread and other bakery products	154
Canning and preserving	113
Car—railroad repair shops	154
Carpets and rugs	360
Cars, electric and street railway	210
Cash registers, etc	126
Cast-iron pipe	218
Cement	145
Cereal preparations	124
Chemicals	105
Chocolate and cocoa products	138
Clay products (other than pottery)	99
Coke	187
Condensed and evaporated milk	118
Confectionery	147
Corn syrup, corn oil and starch	178
Cotton goods	89
Cutlery and edge tools	120
Dyeing and finishing textile	127
Electric machinery, apparatus and supplies	161
Engines, turbines and waterwheels	195
Explosives	177
Flour and other grain-mill products	72
Forgings, iron and steel	170
Foundry and machine-shop products	193
Furniture	165
Gas manufacturing	156
Glass	135
Glue and gelatin	104
Hardware	78
Ice, manufactured	95
Iron and steel (blast furnaces, rolling mills)	221
Jute goods	93
Knit goods	95
Leather	123
Locomotives	278
Lumber and timber products	128
Machine tools	226
Marble and other stone products	140
Minerals and earths treated	128
Motor-vehicle bodies and parts	162
Motor vehicles	94
Musical instruments	121
Paints and varnishes	134
Paper and pulp	138
Petroleum refining	165
Phonographs	106
Photographic apparatus and material	320
Planing-mill products	153
Plumbers' supplies	123
Printing and publishing	125
Pumps and pumping equipment	195
Rayon	67
Refrigerators and refrigerator cabinets	181
Refrigerators, mechanical	143
Rubber goods	94
Rubber tires and inner tubes	131
Salt	136
Screws, wood	170
Sewing machines	75
Ship and boat building	113
Silk manufacturers	79
Slaughtering and packing	128
Smelting and refining copper	90
Smelting and refining zinc	150
Soap	167
Steam and other packing gaskets	175
Steam fittings and heating apparatus	149
Stoves, ranges and furnaces	123
Structural and ornamental iron and steel	338
Sugar, beet	131
Sugar, refining, cane	179
Textile machinery and parts	201
Tin cans and other tinware	139
Wall plaster, wall board	137
Wire	174
Wood distillation and charcoal manufacturing	166
Woolen goods	126
Worsted goods	100
Wrought pipe	294

Contractor-Utility-Engineer Attitude on Helping Architect

FOR years members of every profession and industry which jointly contribute to the production of commercial and public buildings have frequently referred to the obstacles that prevent the full attainment of the client's needs. Insufficient co-operation among the collaborating groups is the chief handicap always emphasized.

To permit an exchange of requirements and the citation of problems and possible solutions, a joint conference was recently held in the Westinghouse Lighting Institute in which architects, illuminating engineers, equipment manufacturers, contractors and utilities participated. The statements of some outstanding architects and fixture manufacturers, as well as men viewing the situation from a broad angle, were presented in the April 12 issue.

Following are some comments from the contractor, illuminating engineer and utility angle. Lamp manufacturer viewpoints will be presented later.

Utilities' Viewpoints

M. E. Skinner
New York Power & Light Company

In many small cities and towns which do not have professional engineers it is necessary for the utility to take over consulting work.

The architect's influence is essential even in speculative buildings, because the ideas in the higher class buildings are copied.

The presence of exposed conduit and raceway in many buildings shows failure to consider the relation of wiring to future uses of electricity.

Some day it is hoped that a plan will be developed whereby the adequacy of electrical facilities in commercial buildings can be certified the same as home facilities are certified by the "red seal."

P. S. Clapp
National Electric Light Association

To make the investment in utility systems work more profitably, utilities are concentrating on commercial activities, and development of commercial, domestic and industrial lighting will be an important feature. Already 300 lighting service departments have been established in as many utilities in the United States, which can be the basis of contact with architects.

Another lighting institute has been established in Chicago, cooperatively, where any one interested in illumination can study effects and secure lighting information. A lighting institute should be established in every major city.

W. H. Horton, Jr.
West Penn Power Company

It should be borne in mind that architects carry on their profession in many small towns outside of New York, Chicago and other large cities, so means should be provided for establishing contact between them and the illuminating and electrical professions.

Julius Daniels
Edison Illuminating Company of Boston

Utilities do not want to take work away from reputable consulting engineers, where the magnitude of the work justifies one, but they are frequently forced to lay out wiring and lighting for small jobs, or even big ones because a consulting engineer is not employed. Where consulting engineers are employed, the utilities are glad to assist them. Particularly is the utility compelled to give consulting service on small buildings and homes where an architect is never called in. In general, however, consulting work should be directed toward reputable consulting engineers.

C. L. Harold
Brooklyn Edison Company

Daily and almost hourly utilities are discovering the necessity of collaborating with architects, financiers and electrical contractors even on speculative buildings. They cannot afford to suffer longer from isolation or single-mindedness and must better relate themselves to architects. There must be a code of understanding so that the best joint service may be rendered to the customer and the client. There is no better way to assure this than to establish personal contact between illuminating engineers and architects.

Illuminating Engineer's Viewpoint

Prof. J. W. Barker
Lehigh University

In designing lighting fixtures their appearance, unlighted as well as lighted, must be considered.

Since the state codes represent minimum values and not even averages of good illumination, architects should plan for double recommended values in wiring. Occupants of buildings will balance the cost of cleaning lighting fixtures against their efficiency,

so that it is very important to consider maintenance in the design of any lighting system, otherwise the plan will be disappointing.

Although most colleges give courses on illumination, most architectural courses only include such courses as elective studies. Still architects are compelled to apply lighting every day.

In many cases no architect or illuminating engineer is engaged by a builder and contractors are relied upon to handle the whole problem.

Contractor's Viewpoint

Lawrence Davis
Association of Electragists:

Lack of vision regarding the development of light applications is evident even in modern buildings within a short time. Many otherwise perfect buildings become obsolete because of inadequate wiring, due to failure to look ahead ten years. For example:

One new $2,000,000 office building was designed for 8 to 9-ft. candle illumination, but a few tenants wanted 30 to 40-ft. candles and could not obtain it because it would cost $30,000 to $40,000 additional to provide these few tenants with additional lighting—all due to inadequate wiring facilities.

A new skyscraper contemplating 25-year leases was originally planned for 2 watts per square foot, but was induced to increase the illumination to 5 to 7½ watts per square foot and provide raceways capable of serving 250 watts per square foot.

A six-year old office building now needs complete relighting, but rewiring will cost $60,000.

Four out of six new department stores built recently could have saved $15,000 apiece very shortly after going into service if the wiring had been planned for future needs initially.

An apartment house wanted a sign on its roof, but to provide it with service cost $5,000 plus considerable inconvenience in interrupted elevator service, because a riser had to be installed in the elevator shaft as the need had not been anticipated.

Another office building wanted floodlighting, but could not provide it because no place had been left for the feeders.

To expand facilities one building had to install exposed conduit because no place had been provided for concealed work.

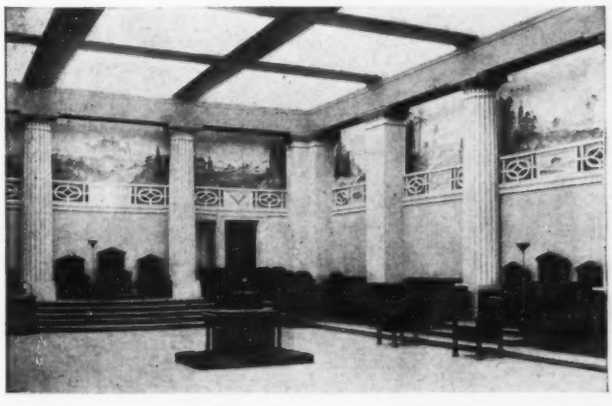
One new building had to turn down several applications for beauty-parlor space because it did not have adequate wiring facilities to provide the necessary electrical needs.

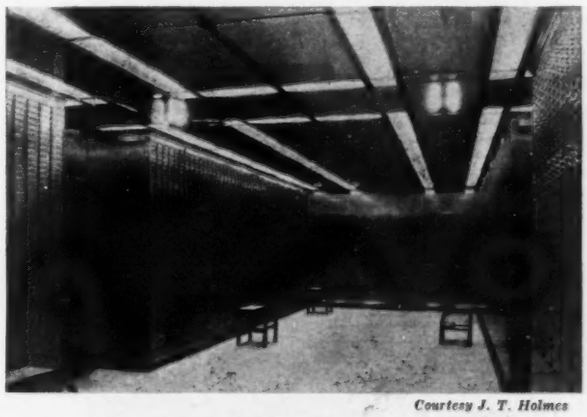
If the return on investment in a building is to be maintained over a period of years precaution should be taken not to allow the building to become obsolete because of inadequate wiring facilities.

One fundamental cause of inadequate wiring is the relationship of the owner, architect, contractor and general contractor to one another. Neither the electrical industry nor the architect, nor the owner wishes to give any contractor a competitive advantage over another, and yet the present basis of competitive bidding does exactly this. Competitive bidding, while it should probably never be entirely eliminated, is bad in its present form because it is based entirely on price and not on the engineering service rendered. Engineering experience and past performance are not too frequently ignored. The problem cannot be overcome overnight, but the fault should be recognized to avoid abuses.

The solution lies in having the engineering work done by consulting engineers and not by contractors. Contractors do not care who prepares the layout and the specifications so long as they are done by reputable consultants who have no interest in getting the wiring business, who are competent to render the service and who know the problem of install- the work as well as the engineering phases of it. Contractors want clear, complete specifications so they will be certain they are all bidding on the same work.

A specification approval and inspection bureau is operating in St. Louis that assures definite specifications so there will be no doubt regarding their meaning. Recording of these specifications assures each contractor that he is bidding on the same thing. All work is inspected and compelled to meet specifications. Chicago is developing a similar ordinance.





Courtesy J. T. Holmes

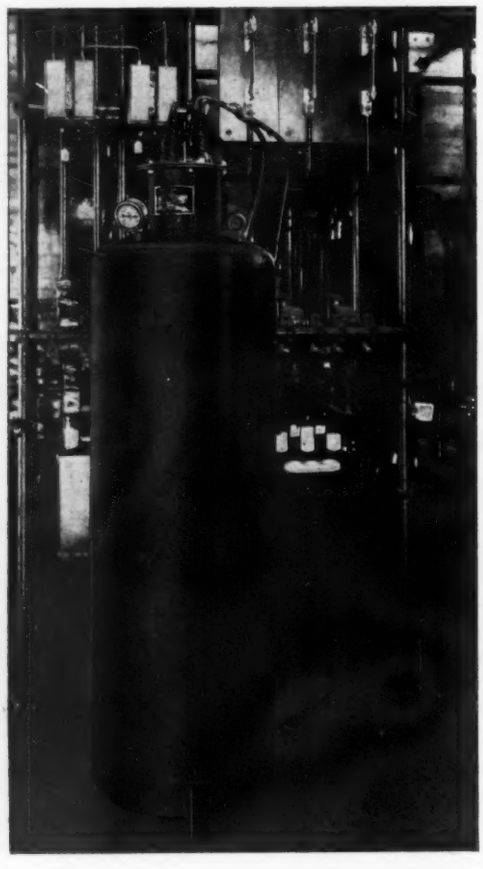
Outdoor appearance obtained by lighting ceiling to simulate sky and illuminated outdoor scenes around balcony. Luminous ceiling panels light safe deposit vault

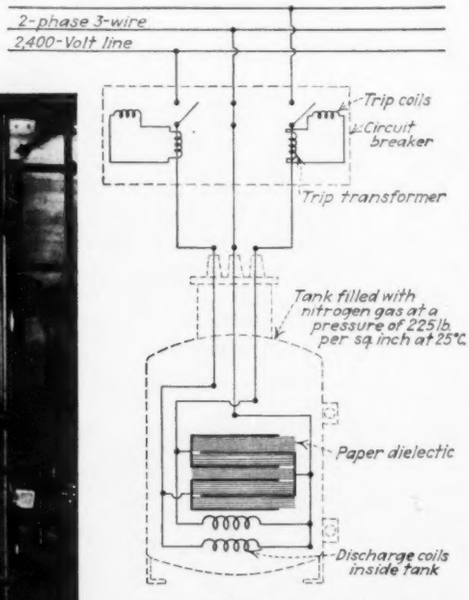
Higher Power Factor Saves $70 Monthly in Small Plant

TO IMPROVE operating conditions at the plant of the David Lupton's Sons Company, Philadelphia, Pa., manufacturer of steel window frames, doors, shelving, etc., several steps toward the raising of the local power factor were taken by that company with both gratifying results along that line and with notable economy.

The power factor was raised to 82 per cent by motor changes, the application of 220-volt condenser capacity and by the application of a 90-hp. synchronous motor. In order to raise the power factor further a "Permittor" was installed about a year ago in the switchboard room and connected to the 2,400-volt service tap of the Philadelphia Electric Company. This accomplished an additional boost from 82 per cent to 90.5 per cent on a measured load of 610 kw. The "Permittor" is of 130-kva. rating for 2,400-volt, 60-cycle, two-phase service.

The "Permittor" is a capacitor without fire hazard, as it is constructed of materials in a non-inflammable combination. Nitrogen under pressure is used as the cooling medium and in combination with linen paper as the dielectric. "Permittors" may be installed without the precautions necessitated by oil-filled electrical apparatus. They are made by the Products Protection Corporation, New York.




2-phase 3-wire
2,400-Volt line
Trip coils
Circuit breaker
Trip transformer
Tank filled with nitrogen gas at a pressure of 225 lb. per sq. inch at 25°C.
Paper dielectric
Discharge coils inside tank

Power-factor correction secured by nitrogen-filled non-inflammable device

The monthly saving effected by this "Permittor" is $70. After 35 months' service, the total of the savings will have equaled, it is anticipated, the expenditure for the equipment, with allowance for interest on the investment during that period.

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READERS' FORUM

Pleads for Tolerance

To the Editor of the ELECTRICAL WORLD:

The article "Co-operation as One Architect Sees It," appearing in the March 15, 1930, issue of the ELECTRICAL WORLD, which reports an interview with William Van Alen, architect, New York, has been of special interest because an architect has been associated with practically every project with which I have been connected during the twenty-odd years of my experience as an electrical engineer.

The answer to Mr. Van Alen's indictment of the illuminating engineers is virtually contained in the statement that "The Chrysler Building is unlike any other that has ever been constructed." In height and shape it unquestionably is, and it also differs in other respects, including the design of the elevator foyer to which he refers. If it had not been different, and did not contemplate the beautiful design which Mr. Van Alen has conceived and executed, it would not have been necessary to engage his special talents and skill, and an ordinary set of plans and standard lighting equipment and fittings would have sufficed.

The difficulty appears when an attempt is made to adapt a beautifully artistic design to utilitarian purposes. If the design is something entirely novel and there is no precedent to follow, it is asking almost too much of an illuminating engineer to prescribe something which will produce an absolutely definite result.

An architect will often make dozens of studies of some feature until he gets a design which is adaptable and is pleasing to the eye. The illuminating engineer hasn't the opportunity to arrange and test several dozen different sets of lamps, reflectors, diffusers, colored glasses and what not, in order to see how serviceable the final result will be. He would not only be put to the expense of building a full-size model of the area to be illuminated but he would have to spend considerable time in making tests to determine what arrangement was

best, and would ultimately scrap the model and experimental material when he got through.

Obviously, this costs more than the sketches which the architect discards and throws into the wastebasket.

Frequently full-size models are made of certain alternate architectural designs because it is not possible to visualize from a design drawn on a plane surface just what the final result might be. How many times does the illuminating engineer get a chance to determine the utility of his suggestions in this manner? Since the result is often a matter of judgment, rather than a rigorous mathematical or physical analysis, it is surprising that the illuminating engineer hits it as closely as he does in the majority of instances.

Mr. Van Alen says, they (the illuminating engineers) appear to be "comparatively short on both facts and imagination." A competent illuminating engineer has plenty of "facts" at his disposal, but he should not be expected to classify as a "fact" the results to be expected from the illumination of some architectural design which is not a "fact" because the design has never been executed before. It is granted that their imagination is less proportionately than that of the architect and there is probably not one in a hundred who could tell in more than a very general way the effect which would be produced by light of different colors falling on surfaces of various colors. Their training generally would not fit them to pass judgment on such a question, and unless they might happen to have encountered it before or had made a special study of color combinations and color lighting, they would probably not have enough artistic intuition to notice it. They would not be following the profession of illuminating engineering if they did, for this particular qualification would fit them to serve in much more remunerative professions.

The problem of electrical distribution in an exceptionally high structure like the Chrysler Building should offer no particular engineering difficulty if it is kept in mind that it is nothing more than a section of a city placed on end, where the corridors represent the side streets and the stairways and elevators represent the sidewalks and cable cars on the main streets with their source of motive power at one end of the street. The only difficulty which might be experienced would be to get the architect to comprehend the magnitude of the problem being faced by the electrical engineer designing the distribution system so that sufficient space would be made available for the necessary substation equipment at the various centers of distribution. More volume is required for these features in the case of a "vertical city" because the various insurance companies, electrical codes and good engineering practice require special precautions where oil-insulated, high-voltage equipment is located inside of the structure and is in such close proximity to human beings unfamiliar with its operation.

In a development of this nature, virtually every cubic foot occupied by such equipment pays rental by preventing just that much space from earning a return. Electrical engineers accustomed to work on projects of this nature generally appreciate this fact and are usually conservative in their requests of the architect for space. It is not often, however, that their moderate requests are granted. The architect, with his limited knowledge of these problems, generally goes ahead with only a minor consideration of such features, and leaves a vertical maze of disconnected "shafts," offset every few floors, into which the various mechanical services have to be festooned as best they may.

Mr. Van Alen states near the end of the interview, "We know what we want." If this knowledge would only be communicated to the engineer when the design is commenced, suitable provision could be made for almost any kind of services and degree of flexibility desired. Frequently, however, the architect is no better informed of these requirements than the engineer and is unable to give specific answers to the engineer's questions. The latter then digs it out for himself and designs the installation accordingly.

Finally, the architect is not necessarily an engineer and should not attempt to dictate to the engineer what means should be employed to accomplish a certain result. Where a special problem, such as that referred to in the case of lighting the foyer of the Chrysler Building, is encountered, no one can predict with mathematical certainty what the result of certain lighting arrangements will be, and it is not fair to the illuminating engineer to condemn him for it. It would likewise be unfair to condemn the architect because his first sketches showing his original ideas were not satisfactory. Recently, each has acquired a better appreciation of the problems of the other. By co-operating to accomplish a result, rather than condemning one another because one cannot appreciate the intangible or indefinite nature of the problems of the other, the engineer would be content to stay in the background and let the architect take the entire credit for the thing which was developed by the co-operative efforts of both.

A CONSULTING ENGINEER.

[The author has given reasons why his name should not be connected with this communication, but the thoughts expressed have sufficient import to justify their presentation even though anonymously.—EDITOR.]

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Residential Sales Average 817 Kw.- Hr. Annually

To the Editor of the ELECTRICAL WORLD:

In the ELECTRICAL WORLD of January 4, 1930, on page 62, there is a tabulation of domestic energy sales of some of the larger utilities. My attention has been called to the fact that the statement in this tabulation in regard to the kilowatt-hour sales of Buffalo General Electric Company is incorrect, except for the year 1925. We cannot check the figures for 1926, but the figures for 1927 and 1928 are for Buffalo, Niagara & Eastern Power Corporation, although the entire four years is credited to Buffalo General Electric Company.

I inclose herewith tabulation of the domestic sales for Buffalo General Electric Company, also of Buffalo, Niagara & Eastern Power Corporation in case you wish to use them for publication in the future. The figures for Buffalo General Electric Company are, of course, included in those of Buffalo, Niagara & Eastern Power Corporation.

L. E. IMLAY.

Buffalo, Niagara & Eastern Power Corporation,
Buffalo, N. Y.

[A chart based on figures sent by Mr. Imlay will be found in the Financial and Statistical section of this issue.—EDITOR.]

BOOK REVIEWS

Elements of Electricity

By Anthony Zeleny. New York: McGraw-Hill Book Company, Inc. 438 pages, illustrated. Price, $3.

This text is designed for the first course in college physics devoted to electricity. Dr. Zeleny has had many years experience in teaching the subject and has designed the book to fit his conception of such a course. As is the case with all such courses, there is too much knowledge to be absorbed readily. The scope covers the entire field of electrical theory, and in addition physical concepts, mathematical analyses and practical applications are included. If the student masters the content he will be well grounded in electrical science, but if he takes the work as a series of doses of knowledge he will gain only a perplexing idea of the subject.

In clear exposition of principles, good illustrations, well-arranged material and in breadth of treatment this text is above the usual standard. It is modern in that it covers the late developments in the art, yet is rigid in its treatment of basic phenomena. It has more of the ear marks of an engineering text than that of the physicist and is certain to have a welcome in engineering colleges. Problems, illustrations and suggested experiments aid greatly in making it useful as a text.

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Advanced Laboratory Practice in Electricity and Magnetism

By E. M. Terry. New York: McGraw-Hill Book Company, Inc. Second edition, 318 pages, illustrated. Price, $3.

The second edition of this text has been extended to cover the vacuum tube more completely, so that a series of experiments covering radio communication has been incorporated. Minor changes and simplification have been made in the previous experiments. The book is a combination of textbook and experimental manual that has proved useful in many schools.

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Handbuch der Experimentalphysik

By W. Schottky, H. Rothe, H. Simon. Leipzig: Akademische Verlagsgesellschaft. 492 pages, 179 illustrations.

A number of volumes of this comprehensively planned series have appeared: The present one is numbered 13, Part II. It deals with electron tubes and takes up the subject under three heads. To the first, the physics of hot electrodes, rather more than half the book is devoted. The essential problem, as the preface states, is to set up the thermodynamic conditions of equilibrium between the hot body and the cloud of electrons, ions and occasionally of neutral particles surrounding it. Starting with the researches of O. W. Richardson and H. A. Wilson shortly after 1900, the historic background is traced and the contributions of successive workers are brought in. The language and the mathematical form are, necessarily, thermodynamic. This part of the subject is carried through the studies of emission under various conditions, to the "shot effect," which term designates the fluctuations in the electron current due to its being the result of a bombardment of individual particles whose emission must be fortuitous, hence must vary from the statistical average that constitutes the mean current.

Part II deals with electrode construction, whether for producing a flow of electrons, ions or a mixture; Part III with actual technical developments and the applications of electron tubes.

Coming from recognized authorities who have collaborated in its preparation the book should be of interest primarily to physicists and research workers interested in this field and to builders of tubes.

It will appropriately have a place in the scientific libraries of research and advanced educational institutions.

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Standards Yearbook, 1930

Washington, D. C.: U. S. Department of Commerce, National Bureau of Standards. 301 pages.

The present volume contains outlines of activities not only of the National Bureau of Standards and other agencies of the federal government and the states, counties and municipalities, but also those of technical societies and trade associations, with special emphasis on their accomplishments during the year 1929, their programs for future work and the methods employed by each organization to encourage or facilitate the use of its standards and specifications. About 25 pages are devoted to a summary of recent work done by the national standardizing bodies of twenty foreign countries and eleven pages to a bibliography on standardization.

Mention should be made also of the comprehensive index, essential to the usefulness of a reference book of this kind; it occupies eighteen pages, closely printed in double column.

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High-Voltage Cables

By P. Dunsheath. New York: Isaac Pitman & Sons. 161 pages, illustrated. Price, $3.

This book is based on a series of lectures given at University College, London, in 1928. It deals with the modern development of distribution and the evolution of cables to meet the modern requirements. The dielectric properties of cables are fully treated, including losses, power factor, stresses and breakdown. The physical properties of cables are discussed and the belted, screened and S. L. types of cables are described and discussed. The modern single-core cable is next treated and then the electrical characteristics are treated in terms of current rating and stability.

Cable joints and terminals are stressed as important adjuncts to successful operation and an interesting chapter is devoted to experimental developments in new types of cables. The book is fundamental in its physics and complete in its description of mechanical design. It is a very welcome addition to cable literature.

Men of the Industry

W. S. Rugg Directs Westinghouse Sales Policies

WALTER S. RUGG, who has been appointed to direct the sales policies of the Westinghouse Electric & Manufacturing Company, as announced in the April 19 issue of the ELECTRICAL WORLD, has been engaged in almost every phase of electrical development, combining the exact and technical training of an engineer with the broad experience of a commercial executive. He became identified with the Westinghouse Electric & Manufacturing Company in 1892 and three years later was transferred from Pittsburgh to the Chicago Office as district office engineer.

W. S. Rugg

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While engaged in this position, Mr. Rugg attracted the attention of the manager of that office, who decided that Mr. Rugg would make an excellent salesman. Quite contrary to the latter's own ideas on the subject, the manager forced Mr. Rugg into selling, with results that pleased the manager and very much surprised Mr. Rugg. Subsequently he removed to New York as special engineer and after occupying the managership of that office went to East Pittsburgh as manager of the railway department. In 1922 he was appointed general sales manager of the company and in 1925 he was named vice-president in charge of engineering. Mr. Rugg will continue to perform the duties of this office in addition to those he has just assumed. He is active in the American Institute of Electrical Engineers, the National Electric Light Association, the American Electric Railway Association and is a member of the Franklin Institute, the American Association for the Advancement of Science, the Engineers' Club of New York and other similar organizations.

SIG. RENZO NORSA of the Compagnia Generale di Elettricità of Milan has been appointed honorary secretary for Italy of the American Institute of Electrical Engineers in succession to the late Signor Guido Semenza.

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Winnipeg Electric Elects New Vice-Presidents

AT THE ANNUAL MEETING of shareholders of Winnipeg Electric Company Lawrence Palk, W. E. Blodgett and C. H. Dahl were appointed vice-presidents of the company. Mr. Palk is now vice-president in charge of executive matters, Mr. Dahl is vice-president in charge of operation and Mr. Blodgett is vice-president in charge of finances and accounting.

Lawrence Palk

An old Winnipeg resident, Mr. Palk was formerly secretary and assistant general manager in charge of executive matters of Winnipeg Electric Company, Manitoba Power Company, Ltd., and Northwestern Power Company, Ltd. He commenced his career as a stenographer for the Winnipeg utility in October, 1904. He was made secretary, secretary and assistant to president and assistant general manager in charge of executive matters. He is also secretary of Winnipeg Electric and associated companies.

For a number of years Mr. Dahl has been assistant general manager in charge of operation. He was born in Appleton, Minn., and after being graduated from Wisconsin University, he removed to Canada. When he started with the Winnipeg Electric Company it was as statistician. In that capacity he familiarized himself with the operations of the various utilities to such an extent that he was rapidly promoted. In 1929 Mr. Dahl was elected president of the Canadian Electric Railway Association.

C. H. Dahl

Mr. Blodgett has long been identified with the public utility industry. He was accountant for the Twin Cities Rapid Transit Company and served as secretary-treasurer of the Utah Light & Traction Company before transferring his interests to the Winnipeg Electric Company in 1920. Mr. Blodgett is also treasurer of Manitoba Power Company, Ltd., and Northwestern Power Company, Ltd., and associated companies. He is a native of Wisconsin.

R. C. Tenney Made President of Tenney Organization

ROCKWELL C. TENNEY has been elected president of Charles H. Tenney & Company, Boston, Mass., succeeding Palmer York, who has resigned for reasons of health after a distinguished career in the presidency of this well-known managerial, financing and engineering company. Isaac S. Hall, vice-president of the Tenney company, has been elected treasurer with the continuing title of vice-president.

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MAURICE C. BURRITT of Hilton has been designated a member of the Public Service Commission of the State of New York by Gov. Franklin D. Roosevelt. Mr. Burritt was formerly head of the Cornell University Extension Service, vice-dean of the State Agricultural College and financial officer of a produce exchange. He has been president of the State Horticultural Society and the Governor's Agricultural Advisory Commission.

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E. L. EDWARDS has been elected president of the Michigan Electric Power Company and executive in charge of all Insull properties in the lower peninsula of Michigan, with headquarters in Lansing. Mr. Edwards has been identified with every department of the electrical utility industry, including practical engineering, financial and merchandising work.

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E. D. Kilburn to Engage in Private Business

EDWARD D. KILBURN, who has resigned from the office of vice-president and general sales manager of the Westinghouse Electric & Manufacturing Company, as announced in the April 19 issue of the ELECTRICAL WORLD, will occupy offices in the Westinghouse Building, 150 Broadway, New York, to engage in private business.

Mr. Kilburn has long been prominent in the electrical industry. He entered the employ of the Westinghouse company in 1906 as a graduate student, after receiving an engineering degree from

Cornell, and during his long service with the Westinghouse organization rose steadily, becoming in turn manager of the New York power and railway department, manager of the New York district office, vice-president and general manager of the Westinghouse Electric International Company, and sales executive of the Westinghouse Electric & Manufacturing Company.

In connection with his position with the Westinghouse Electric International Company Mr. Kilburn traveled extensively abroad.

He is a member of the American Institute of Electrical Engineers, the Japan Society, India-House, the Engineers Club and the Railroad Club, all of New York.

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OBITUARY

JOHN B. SHERIDAN, formerly manager of the Missouri Committee on Public Utility Information, died suddenly at Alexian Brothers Hospital, St. Louis, Mo., March 15, following a nervous breakdown. Mr. Sheridan terminated his active connection with the Committee on Public Utility Information in the summer of 1928, shortly after he attracted nation-wide attention through testimony given before the Federal Trade Commission at Washington concerning the activities of his organization. Prior to entering the public utility publicity field, he had worked in various newspapers in St. Louis over a period of some thirty years.

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FRED M. LOCKE, inventor of the porcelain insulator and oven glass, died suddenly at his home in Victor, N. Y., April 15. Grief over the death of his son and co-worker, on March 7, undoubtedly shortened the life of the inventor, who was the originator of many devices and materials besides the insulator. Mr. Locke began the manufacture of the porcelain insulator in 1898, and from a small beginning the Locke Insulator Manufacturing Company resulted. Mr. Locke retired from active business in 1904 and since had devoted all of his time to inventions at his laboratory located at his home in Victor.

•

CLARENCE H. NORWOOD, 56 years old, president of the Norwood-Noonan Company, electrical engineers of Chicago, died at his home April 12. Mr. Norwood was a pioneer in development of electrical control for bridges. Following graduation from the University of California he was associated with the Siemens & Halske Electric Company, Cutler-Hammer Manufacturing Company and other electrical manufacturers. After engaging in electrical contracting work in Chicago for a period of time he helped to organize the Norwood-Noonan Company. Mr. Norwood was a past-president of the Chicago Engineers Club and a member of the Western Society of Engineers.

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PROF. EDWIN H. LOCKWOOD of Yale University, well-known mechanical engineer, died April 17 at the New Haven Hospital, New Haven, Conn., of heart disease. A native of New Canaan and a graduate of the Sheffield Scientific School of Yale University, he joined the teaching staff of Yale in 1890. In 1900 he was made an assistant professor of mechanical engineering and in 1924 an associate professor of that subject. Three years later he was appointed high professor of mechanical engineering. During his long career on the Yale faculty he taught almost every subject in mechanical engineering and had become known throughout the country for his important investigations on fuel combustion in power and heating. Professor Lockwood was 65 years of age.

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JOHN F. CHUTE, chief of electrical operation, operating department, Brooklyn Edison Company, died April 7 at St. Mary's Hospital, Brooklyn, after a brief illness. He had been with the company since 1887, when he was employed as dynamo attendant in the Rockwell Place station of the Citizens Electric Illuminating Company of Brooklyn, which later became a part of the Brooklyn Edison Company. After successive promotions he was appointed, in 1906, to the newly created position of chief system operator, which he held until his death, although the title was recently changed to chief of electrical operation. In that capacity he had charge of the administration of all generating station electrical forces, the operation and maintenance of the electrical equipment in the generating stations, load dispatching, fault location and the testing and phasing of feeders.

Financial and Statistical News

REVAMPING of capital structures has been a feature of utility activities during 1929 as reflected in references to simplification and strengthening processes in the currently issued annual reports of many of the leading companies. Although structures became somewhat more involved through ownership transfers in certain of the Eastern systems, many corporate entities were wiped out and many outstanding issues retired elsewhere.

——PURPOSELESS UP AND DOWN MOVEMENTS marked the week's trading in utility stocks, although foreign buying seems to have been resumed and there is ample support on recessions. Electric Power & Light has been a trading feature.

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Insulls Organize Company in Canada

A SUBSIDIARY INVESTMENT COMPANY, the Middle West Utilities Company of Canada, Ltd., has been organized by the Middle West Utilities Company. The initial authorized capitalization will be 50,000 shares of preferred stock and 500,000 shares of common stock. Operating subsidiaries of the new company are Great Lakes Power Company, Algoma District Power Company and the National Utilities Company, located on the Great Lakes waterway. In addition, the company has an investment in undeveloped hydro-electric sites and in industrial enterprises.

Officers of the new company are Samuel Insull, chairman of the board; Samuel Insull, Jr., vice-chairman of the board; Martin J. Insull, president; J. A. McPhail, vice-president; A. J. Thomas, vice-president and secretary, and J. M. McNeil, treasurer.

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Consumers Power Has Speeded Up Construction

THE CONSUMERS POWER COMPANY has materially increased, rather than curtailed, general construction expenditures, employment and wages during the temporary business depression, according to Vice-President and General Manager Charles W. Tippy.

During the first quarter of the current year the number of persons employed was 1,426 in excess of the total on the payroll for the same period in 1929 and wages were increased $476,199. Expenditures and purchases incident to a speeded-up construction program, and not including any regular operating expenses, were increased $2,413,867.

"Consumers Power Company never has doubted that the present depression will be of short duration and we look for a gradual return to normal conditions," said Mr. Tippy. "With this in mind, we have proceeded with our original plans for improvements and extensions, knowing that, when the expected reaction takes place, we must be prepared immediately to meet substantial increases in the demand for electric and gas service.

"During the first quarter of 1929 Consumers Power Company's expenditures for construction and improvement were $3,130,184. This year, during January, February and March, our construction expenditures totaled $5,544,052 or an increase of $2,413,867 for the first quarter of 1930."

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Seek Coast Company

AN OFFER OF $79.50 a share has been made to the stockholders of the Sierra Pacific Electric Company by Stone & Webster, Inc.

Through acquisition recently of a block of the stock from United Gas Improvement Company, Stone & Webster now own 48 per cent of the coast company's stock, but will acquire 100 per cent if the present offer is accepted by the shareholders.

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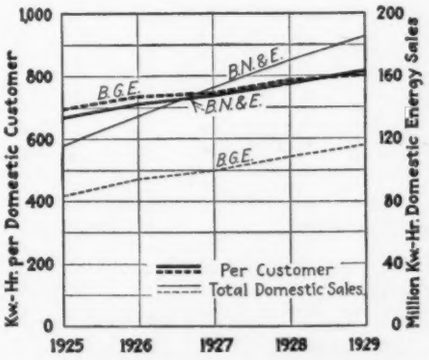
Domestic Use Grows Steadily

AN INCREASE of 20.6 per cent in four years in the annual energy consumption per residential customer is shown in data recently made available by the Buffalo, Niagara & Eastern Power Corporation.



Growth of residential service of the Buffalo, Niagara & Eastern Power Corporation

A close parallel to this growth from 669 kw.-hr. per residential consumer in 1925 to 817 in 1929 for the system as a whole is seen in the figures for its major constituent, the Buffalo General Electric Company, which increased from 694 kw.-hr. in 1925 to 802 kw.-hr. per residential customer in 1929.

During the earlier year the total domestic energy sales were respectively 115,533,624 kw.-hr. and 83,822,470 kw.-hr.; last year they were 185,227,163 kw.-hr. and 115,794,425 kw.-hr.

For the system as a whole this indicates a gain of about 60 per cent. Meanwhile the corresponding number of customers increased more than 30 per cent. New customers generally take less than the company's average at the time; the rate of increase therefore for those who were on the lines throughout the period was presumably well above 20 per cent.

The consumption here reported is much in excess of that for the country as a whole; the 41 large companies for which statistics are at hand over a period of several years averaged 507 kw.-hr. annually per residential customer at the end of 1928.

In the ELECTRICAL WORLD of January 4, on page 61, statistics for the growth of such sales by the Buffalo General Electric Company and the larger corporation with which its statistics were

subsequently combined were given from the reports then available. It is now possible to give the two separately. In the present statistics the average number of customers for the year, rather than the number at the end of each year, has in each instance been used in computing the kilowatt-hours per customer.

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Recent Listings

NEW YORK STOCK EXCHANGE has authorized the listing of 4,655 additional shares of common stock of the Federal Light & Traction Company and 2,976,293 shares of common stock of the Southern California Edison Company, Ltd. There have also been authorized for listing on the Big Board 5 per cent 30-year gold debentures of the Utilities Power & Light Corporation, totaling $36,000,000, in addition to 34,000 additional shares of the corporation's class A stock. The governing committee approved the listing, upon notice of issuance, of 1,224,498 additional shares of Stone & Webster, Inc., capital stock, being the maximum number of shares issuable in exchange for 2,040,831 shares of common stock of the Engineers Public Service Company.

The Baltimore Stock Exchange has approved the listing of 106,127 shares of additional common stock of the Consolidated Gas, Electric Light & Power Company of Baltimore and also the listing of additional first refunding mortgage 4½ per cent gold bonds, series B, of the Pennsylvania Water & Power Company.

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New Electric Locomotives

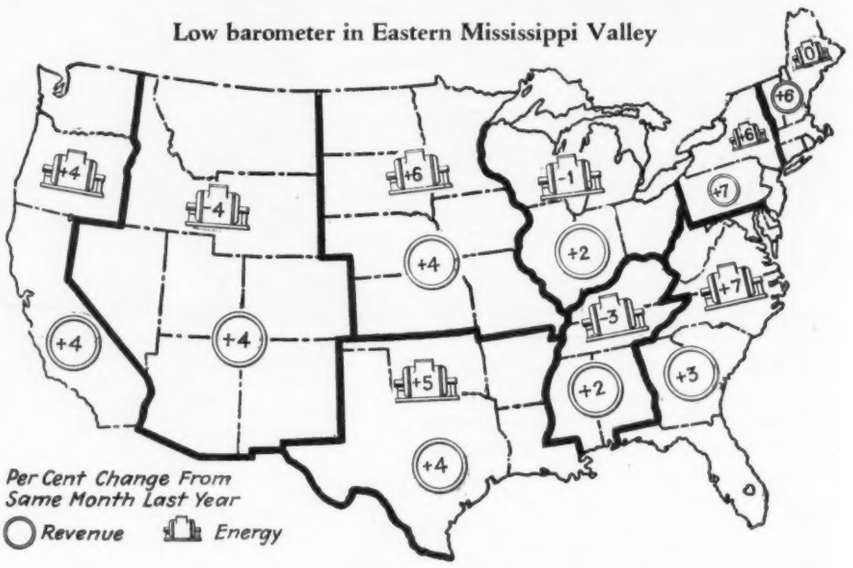
AGAINST a total of 707 steam locomotives for the domestic market, 39 electrics were shipped from the works during the year 1929, according to statistics released by the Department of Commerce. No electrics were shipped out in January, four in February, against 48 and 60 steam locomotives, respectively. Unfilled domestic orders at the end of February included 46 electrics and 479 steam locomotives.

Modest February Gains for Utilities

WITH a total revenue for February estimated at $186,100,000 on the basis of returns thus far received by the ELECTRICAL WORLD, the earnings of the electric light and power industry exceeded those for the corresponding month in 1929 by somewhat more than 5 per cent. The decrease of 6 per cent from January is nearly normal; the shortness of the month would alone account for a seasonal decrease of 10 per cent, but that is in part balanced by the concentration into fewer days of payments for energy received during the preceding long month—a circumstance due more to pecularities of our calendar than to peculiarities of the electrical industry. Expressed in terms of average daily earnings the revenue shows, in fact, a gain of 4 per cent over the preceding month. Net earnings increased in greater ratio than gross, for operating expenses rose less than 3 per cent.

Unlike the situation in some other industries, electrical utility earnings continue to reveal growth when compared month by month with other years. The rate of growth, however, has been less and less rapid since the August peak. There is a temptation to see only the slackening pace; but the average daily revenue for February increased 12 per cent from 1928 to 1929; in 1930 it was 18 per cent greater than in 1928.

Low barometer in Eastern Mississippi Valley



Energy output for central station companies, excluding as usual such other public utilities as railways, was 7,182,772,000 kw.-hr. Although it is the highest February output in the history of the industry, the gain over the preceding year, scarcely 3 per cent, is exceptionally small. A large part of the usual expansion in the consumption of energy for industrial purposes is missing.

Regional changes

In the matter of revenue each of the nine geographical regions enjoyed an increase; the industrial East shows up better than the average for the country as a whole, but in the great manufacturing area in the upper Mississippi Valley the gain was slight. The agri-

Table I—Central-Station Financial Operations in the United States[1]

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1929 Thousands	1928 Thousands	Per Cent Inc.	1929 Thousands	1928 Thousands	Per Cent Inc.
November..	$190,200	$177,600	+7.1	$80,930	$74,950	+8.0
December..	192,300	180,400	+6.6	82,150	77,300	+6.3
	1930	1929		1930	1929	
January....	198,360	187,000	+6.1	82,410	78,100	+5.5
February...	186,100	176,800	+5.2	76,700	74,700	+2.7

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1929	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
November....	3,493,139	+1.3	1,145,389	+92.1	11,480,203	+54.7
December.....	3,708,898	+4.8	1,076,607	+32.3	10,007,930	+40.6
1930						
January.....	3,706,755	—2.4	1,064,347	+77.0	9,803,643	+23.7
February.....	3,156,070	—6.9	717,156	—12.6	9,273,081	+27.9

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.
(1) The financial statistics have been revised as explained in the text.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1929	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
November	7,883,780	+6.8	2,580,529	—5.0	5,303,251	+13.7	1,801,000	+20.8
December	8,110,989	+8.0	2,696,365	0.0	5,414,624	+12.5	1,808,000	+17.8
1930								
January	8,245,114	+6.7	2,865,507	+12.3	5,379,607	+ 3.9	1,738,000	+16.8
February	7,182,772	+2.7	2,554,079	+9.4	4,628,693	0.0	1,567,000	+ 6.4

Table IV—Regional Operations, Revenue and Energy Output in February, 1930

Compared with Corresponding Month of Previous Year

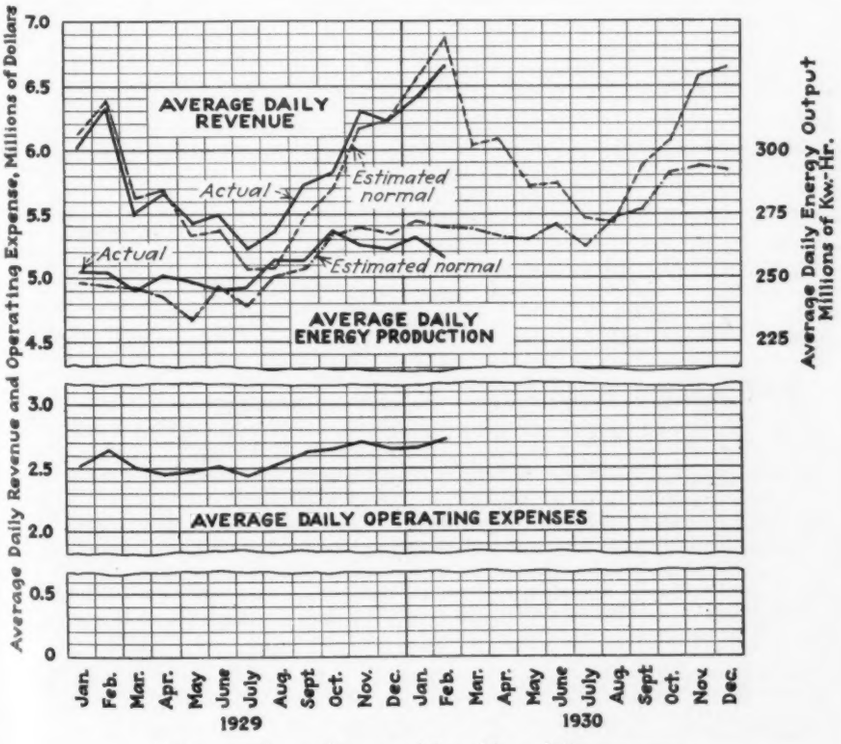
Region	Estimated Revenue[1]		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	186,100	+5.2	7,182,772	+2.7	2,554,079	+9.4	4,628,693	0.0
New England	18,890	+6.2	467,822	0.0	169,174	+8.7	298,648	— 5.4
Middle Atlantic	49,100	+6.9	1,755,148	+5.8	482,467	+1.5	1,272,681	+ 2.6
East North Central	47,160	+2.4	1,791,701	—1.1	168,553	+6.7	1,623,148	— 1.8
West North Central	15,100	+4.2	425,817	+5.7	96,647	—12.7	329,170	+12.7
South Atlantic	20,110	+3.4	952,135	+6.6	564,355	+26.3	387,780	—13.0
East South Central	6,310	+2.0	272,494	—3.2	216,002	—7.3	56,492	+17.1
West South Central	9,510	+4.2	376,248	+4.8	8,884	+9.2	367,364	+ 4.7
Mountain	4,360	+3.5	263,899	—3.7	216,400	0.0	47,499	—17.1
Pacific	15,560	+4.0	877,508	+4.0	631,597	+8.2	245,911	— 5.5

*As collected by U. S. Geological Survey.
(1) The revision of the statistics on revenue is discussed in the text.

cultural sections fared better. Their rate of growth electrically is moderate; the gain of 4 per cent, for example, in the West North Central States is as large as it has been on occasions in the past when the industrial regions were much more active. There has been a notable change in the Southwest. For a long time that region reported remarkably large gains compared with the corresponding month of the preceding year. For several months that has not been the case, the returns for the West South Central States reflecting a rate of increase no greater—in February it was somewhat less—than the national average.

Energy output shows regional characteristics in general similar to those for revenue, except that certain parts of the country show an actual, though plainly only temporary, decrease, again of most importance in the East Central States. New England produced virtually the same amount as she did a year ago, while the middle and southern Atlantic groups, the upper Middle West and the Pacific States exceeded the national average.

As stated in the ELECTRICAL WORLD of March 29, on page 665, the revenue figures for 1929 have been revised, and therefore differ somewhat from those previously published.



February brought record-breaking daily revenue

Electric Plants in Asia Minor

CENTRAL ELECTRIC LIGHT and power plants to the number of 72 are listed in special circular No. 585, revised, issued by the electrical equipment division of the Bureau of Foreign and Domestic Commerce, Department of Commerce. The generator rating is not given in all cases; for those listed the total is 53,241

Central Light and Power Plants in Asia Minor

(Including Turkey and Persia)

Country	Number of Plants	Capacity, Kw.
Arabia	1	795
Iraq (Mesopotania)	19	4,036
Palestine	5	.....
Persia	12	1,478
Syria	9	14,050
Turkey	14	32,342
*Smyrna district	12	540
	72	53,241

*Includes only plants of more than 25 hp.

kw. Nearly half of this is in the 26,000-kw. plant in Constantinople.

The circular gives in each case the location, name of plant, capacity in kilowatts, type and voltage of secondary distribution and type of prime mover, so far as these have been ascertained.

Greek Holding Company Organized

A NEW COMPANY has been formed under the name of the Hellenic Company of Greece by the European Electric Corporation, in association with some of the largest banks in Greece, as the first Greek public utility holding company. The new company will have an interest in the electric power and light property serving Athens, which has a population of more than 250,000. The European Electric Corporation was formed early this year in Canada to act in a supervisory capacity for electric power and light and other public utility properties in Europe.

Business News and Markets

General Electric and Westinghouse Get Radio Corporation Control

THE long-discussed reorganization of Radio Corporation of America at last transfers control of that organization to General Electric Company and Westinghouse Electric & Manufacturing Company jointly through ownership of 51.3 per cent of the voting stock. The final stage of the deal is the transfer of additional stock, totaling about $390,000,000 at current price levels, to the two electrical companies in exchange for factories and equipment, patent rights and other considerations.

Since the organization of Radio Corporation, 60 per cent of its apparatus requirements have been manufactured by General Electric and 40 per cent by Westinghouse, but under the new plan Radio Corporation itself becomes a manufacturing concern.

The new plan calls for the issuance of 6,580,375 shares of common stock of the Radio Corporation, or an amount equal to all of the common stock now outstanding, to the General Electric and Westinghouse companies, the former to receive 3,948,225 shares, or 60 per cent, and the latter 2,632,150 shares, or 40 per cent of the new stock.

This stock is to be issued in payment for the rights and properties to be acquired by Radio Corporation from the electric companies, which are said to be substantially equal in value to the tangible assets of Radio Corporation represented by the common stock now outstanding.

General Electric and Westinghouse companies will also transfer their holdings in the various radio subsidiary companies to the Radio Corporation, so that it will have 100 per cent ownership of these companies, including National Broadcasting Company, Inc., the R.C.A. Victor Company, Inc., the R.C.A. Radiotron Company, Inc., and R. C. A. Photophone, Inc., in which the Radio Corporation now owns 50 to 60 per cent and the electric companies three-fifths and two-fifths of the balance, respectively.

Full details of the plan will be submitted to shareholders of Radio Corporation at a special meeting to be held May 6.

The plan will virtually terminate the pooling of radio patents entered into with General Electric Company, Westinghouse Electric & Manufacturing Company and American Telephone & Telegraph Company, it is understood.

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Allis-Chalmers Unfilled Orders Up 21 Per Cent

THE REPORT of Allis-Chalmers Manufacturing Company for the first quarter of 1930 shows net profit of $1,170,937 after all charges, including federal taxes, equivalent to 93 cents per share on the new no-par common shares outstanding. This compares with net profit of $1,013,374 for the corresponding quarter a year ago, which equaled 81 cents per share on a similar basis, an increase of over 15½ per cent.

Orders booked in the current quarter aggregated $14,661,418, contrasted with $13,260,192 in the early quarter of 1929, an increase of 10½ per cent. Unfilled orders March 31, 1930, amounted to $15,570,365, representing an increase of 21 per cent over those at the end of 1929, when they amounted to $12,872,676.

Bookings in the first quarter of 1930 surpassed any previous corresponding period in the company's history, each month showing a substantial increase over the preceding one. The present number of employees, 9,300, is also a high mark. Tractor orders continue to run ahead of production.

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35 Per Cent Tariff Rate on Equipment

ELECTRICAL MACHINERY and appliances have been accorded a tariff rate of 35 per cent ad valorem by the conference committee, which now has finished the commodity schedules, setting nearly all the tariff rates in essentially their final form. The new law, if passed in the form now proposed, will have little effect on the power industry.

Electrical machinery and appliances have been entered usually under a basket clause at 40 per cent; sometimes at 30 per cent if classified as machinery. Thus the 35 per cent rate proposed is no drastic change. The specific mention will permit tariff commission action if the flexible clause is retained. By committee action, steam turbines, which are at 15 per cent, as are reciprocating engines, under the 1922 act now in force, are recommended for specific mention at 20 per cent. The important basket clause for machinery and parts not specially provided for takes a reduction from 30 to 27½ per cent.

Nothing has been done as yet about the tariff on electric light poles, which will come up in the House debate on the contested lumber paragraph.

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Westinghouse Sales Billed Down Slightly for Quarter

SALES BILLED BY THE Westinghouse Electric & Manufacturing Company are only marginally below the totals for first quarters of the past two years. Orders received and total income show declines in the statement presented, but these two items include no radio business.

As announced in the company's 1928 annual report to the stockholders, the manufacture and sale of radio receiving sets and radio tubes was transferred as of January 1, 1930, to separate corporations, in exchange for an appropriate stock interest in those corporations.

Orders received during the quarter ended March 31, 1930, for products other than radio products exceed the value of orders for similar products booked during the first quarter of the previous year.

Totals for the first quarters of the past three years follow:

Orders, Sales and Income for First Quarter

	1930	1929	1928
Orders received	$47,150,196	$59,852,029	$47,847,477
Sales billed	45,043,934	45,680,249	45,449,794
Net income after depreciation, reserves and taxes	4,547,743	5,882,058	4,336,931
Interest charges	1,125	250,358	378,587
Balance available	4,546,618	5,631,700	3,958,344

Electrical Manufacturing Declines During March

REPORTS received by the ELECTRICAL WORLD from a large proportion of the electrical manufacturing companies of the country indicate that March witnessed a decrease in rate of operations of slightly more than normal proportions. The March rate of operations was 5.7 per cent under February, but was still 5.1 per cent above that reported for March last year. Operations for the first quarter of the year averaged 10.6 per cent above the same period in 1929. This is one of the very few industrial groups reporting operations above the same periods last year.

The closing months of the first quarter find the larger electrical manufacing companies in a slightly more favorable position than the group of smaller companies, although both groups were operating above March last year. The group of larger companies recorded a March increase of 1.6 per cent over February and was still operating at a rate 16.3 per cent above March, 1929. The average rate of operations of these larger companies during the first quarter was 16.0 per cent above that during the same period last year.

Activity in the group of smaller electrical manufacturing companies is not so favorable. This group recorded a decrease in operations during March of 9.7 per cent and was operating on a plane 0.7 per cent under March, 1929. The average rate of operations of this group during the first quarter of 1930, however, was 7.7 per cent above the same period last year.

Comparative indexes of productive activity in the electrical manufacturing industry based upon the consumption of electrical energy by these plants, adjusted for number of working days and referred to the period 1923-25 as 100, are shown in the following table:

March, 1930	155.8
February, 1930	165.2
January, 1930	156.2
December, 1930	157.0
March, 1929	148.3
Average first quarter 1930	159.1
Average first quarter 1929	143.8

Timken Roller Bearing Elects New Officers

AT THE ANNUAL MEETING of directors of the Timken Roller Bearing Company on April 15 H. H. Timken, formerly president, was elected chairman and M. T. Lothrop, formerly a vice-president, was elected president. L. M. Klinedinst was elected a vice-president and R. C. Brower was named secretary-treasurer. The other vice-presidents were re-elected.

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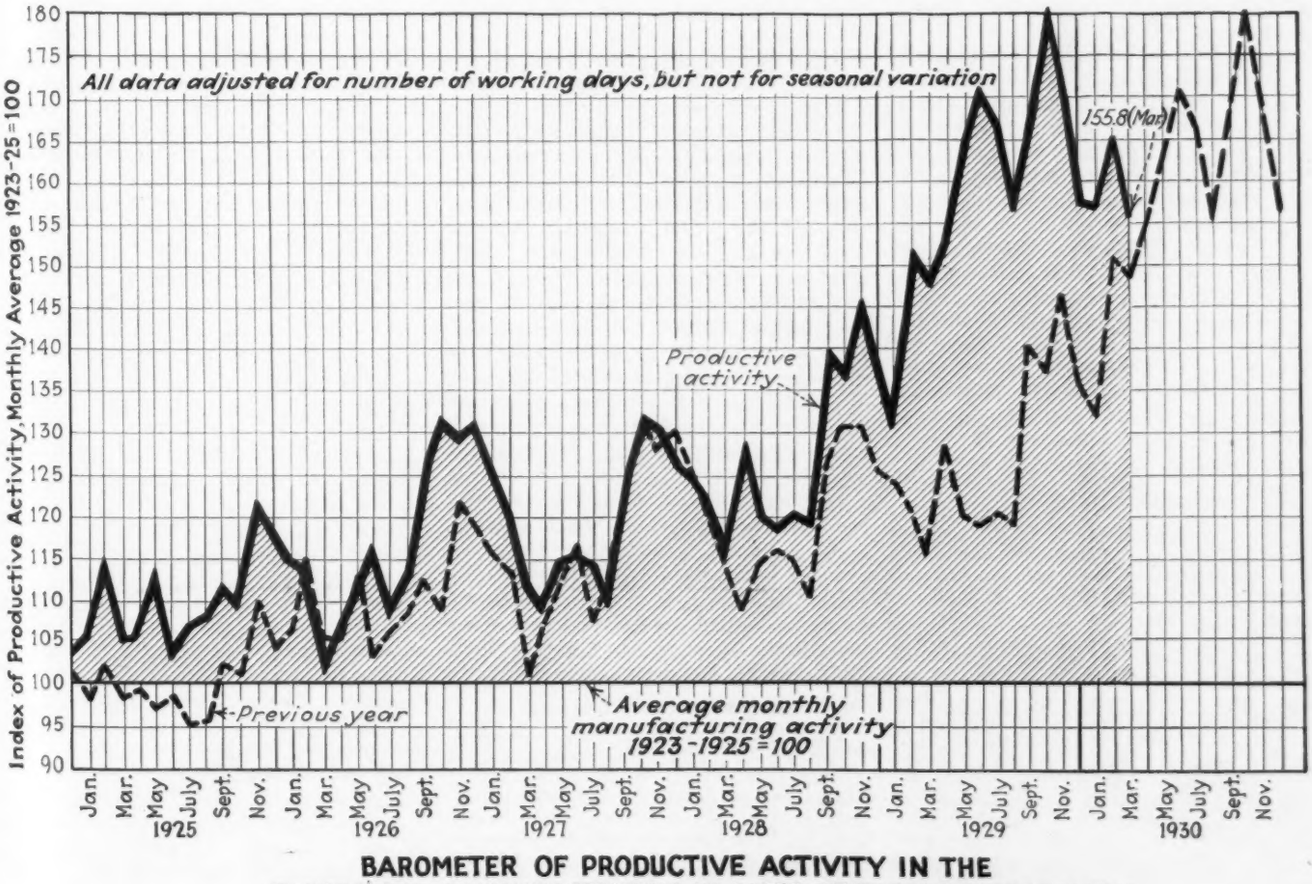
Metal Prices Weak

LITTLE SIGN of price strengthening in the metal situation can be gleaned from the events of the last week. Sales have been in small volume and prices have shown a tendency to go down. Twelve-cent copper is anticipated.

	April 16, 1930 Cents per Pound	April 23, 1930, Cents per Pound
Copper, electrolytic	14	14
Lead, Am. S. & R. price	5.50	5.50
Antimony	7¼	7¼
Nickel, ingot	35	35
Zinc, spots	5.20	5.10
Tin, straits	36¼	35¾
Aluminum, 99 per cent	24.30	24.30



BAROMETER OF PRODUCTIVE ACTIVITY IN THE ELECTRICAL MANUFACTURING PLANTS OF THE UNITED STATES

Market Conditions

LARGER equipment commitments are rather scarce throughout the Eastern district this week, although small orders are well sustained. Small motor sales feature New England business, while central station business is quiet.

——MIDDLE WEST AND PACIFIC COAST BUSINESS is holding up well, with a substantial volume of orders from the utilities.

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MIDDLE WEST

— GENERAL BUSINESS IN THE *Middle West section shows signs of improvement. The volume of business has increased somewhat and a more cheerful attitude is noticeable. Encouraging reports are being received from the steel and automotive industries and industrial activity is improving somewhat.*

—MANUFACTURERS OF AGRICULTURAL *implements are receiving a good demand for their products, while mail order sales are better.*

Contrary to expectations, considerable bookings of copper and copper parts have been made this week. The various utility companies are conservatively proceeding with all necessary construction and extension work. Some of the interesting orders placed this week include flues and ducts to cost $96,000, speed selector switches to cost $10,000, ten 333-kva., single-phase, oil-insulated, self-cooled, 12,000-volt transformers, "Mazda" lamps valued at $150,000 and 400,000 lb. of triple-braid weatherproof wires and cables.

Jobbers' sales show a slight increase, although general conditions are not satisfactory. There has been an excellent demand for electric refrigerators and electric clocks. Railroad business is holding up exceedingly well with a slight gain in industrial sales.

CONSTRUCTION PROJECTS

Allis-Chalmers Manufacturing Company, West Allis, Wis., has plans for an addition to plant for switchgear and transformer manufacture to cost $275,000. Trane Company, La Crosse, Wis., has filed plans for an addition to heating equipment factory to cost $150,000. Michigan Limestone Chemical Company, Rogers City, Mich., has plans for a power plant to cost over $50,000. Board of Water Commissioners, Detroit, Mich., will receive bids until April 30 for pumping plant at Dearborn, to cost over $1,500,000. Sanitary District of Chicago, Ill., has plans for pumping plant to cost about $4,000,000. Caterpillar Tractor Company, Peoria, Ill., will build an addition to cost $200,000. Ohio Power Company, Canton, Ohio, plans power substation at New Boston, to cost $50,000. Northern Light & Power Co., Mizpah, Minn., plans ornamental lighting systems at Pollock, Ipswich, Eureka and Steele, S. D. Miller, S. D., plans extensions in municipal power plant.

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SOUTHEAST

—ACTIVITIES EASED OFF *somewhat last week, though the total volume of business remains reasonably satisfactory. Purchases of turbines were the outstanding features last week.*

A municipality in North Carolina purchased a 5,000-kw. unit, while a Florida town ordered a 2,500-kw. unit and a Mississippi town a 2,000-kw. turbine, the three orders aggregating $200,000. A central station in Georgia ordered $35,000 worth of miscellaneous switching equipment and $25,000 in voltage regulators and lightning arresters. One manufacturer reports the receipt of four orders last week from Mississippi totaling $25,000. One company ordered three 833-kva. transformers last week, while its distribution and small power transformer purchases in the past ten days totaled $10,700. A Georgia company has asked for bids on 200,000 lb. of bare and weatherproof copper and 600,000 lb. of bare copper. Elevator equipment totaling in excess of $250,000 has been ordered on two office building jobs under way in Atlanta and similar equipment to the extent of $125,000 will shortly be ordered on another office building that is being enlarged and remodeled in the same town. The Georgia Power Company last week completed an electric range campaign to set what is claimed to be a world's record of 3,307 ranges sold in seven weeks.

CONSTRUCTION PROJECTS

Virginia Electric & Power Company, Richmond, Va., plans extensions in hydro-electric power plant on Roanoke River. Fields Manufacturing Company, Mouth of Wilson, Va., plans hydro-electric power plant on New River for textile mill service. Quartermaster Corps, United States Army, Fort Thomas, Ky., will receive bids until May 8 for a refrigerating plant (Circular 49). Kinston, N. C., will receive bids until May 7 for 3,500-kw. turbo-generator, surface condenser, switchboard and auxiliary equipment for municipal power plant.

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PACIFIC COAST

—TWENTY OUT OF *26 leading Pacific coast industries record a lower volume for the first quarter of 1930 than for 1929. Lumber shows a 16 per cent decrease over a poor year; petroleum, citrus fruits and mining also show declines. Mid-April, however, seemed to mark the turning point, especially in machinery purchases by rather dormant industries.*

Orders include $9,500 worth of hoisting equipment for a Nevada gold mine, a $3,000 switchboard, a generator and exciter for a lumber company, $15,000 worth of drilling motors for a southern California oil field and $10,000 worth of power-factor correctors for a bridge company. Electric railway material is unusually brisk, Westinghouse reporting two motor-car and two trailer equipments for the Southern Pacific Railway, interurban cars valued at $85,000, and General Electric reporting pantograph trolley equipment for the Key System valued at $60,000.

Power company buying is good except in California, including Westinghouse motors and motor-generator sets valued at $15,000 for Los Angeles, $50,000 worth of distributing transformers for Seattle and $40,000 worth of Westinghouse circuit breakers for Tacoma. The proposed three-company merger affecting northern and central California is awaiting the State Railroad Commission decision, which is expected in May. The Fresno steam plant, costing $3,500,000, along with approximately $750,000 worth of material, principally substation and distribution transformers, is held up pending this decision.

Board of Contracts and Awards, Tacoma, has given a contract for furnishing two steam boilers complete with superheaters, fans, fuel-burning equipment and structural supports. Boilers with steaming capacity of 134,000 lb. per hour were ordered for Puget Sound Machinery Depot, Seattle, for $353,986, to be installed in Steam Plant Auxiliary No. 2. for which oil circuit breakers, current-limiting reactors, transformers and disconnecting switches costing in excess of $53,000 have been bought, as noted last week. Tacoma on April 21 opened bids for one 75-ton capacity four-motor electric crane, low bid being $17,409. Board of Public Works, Seattle, about the middle of May will call bids for furnishing approximately

$100,000 worth of substation apparatus, including thirteen 2,000-kw. transformers, two 600-amp., 26,000-volt oil circuit breakers, cable, insulators, etc. Construction of a $420,000 steam power plant to supplement the city's present system has been authorized by Eugene, Ore., water board and expenditures totaling $215,000 will be made by the British Columbia Electric Railway Company at Fir Street substation, apparatus including transformers and circuit breakers to control four incoming 12,000-volt circuits.

CONSTRUCTION PROJECTS

Southern California Edison Company, Los Angeles, Calif., plans substations at Long Beach, Pomona, Monrovia, Redondo Beach, Santa Barbara and other points. Pacific Gas & Electric Company, San Francisco, Calif., contemplates an ornamental lighting system at Chico. Los Angeles and Gustine, Calif., plan ornamental lighting systems. La Grande, Ore., plans ornamental lighting system. Seattle, Wash., contemplates steam-operated electric power plant for municipal service, estimated to cost $200,000. Centralia, Wash., will receive bids until April 29 for municipal hydro-electric power plant on Nisqually River. Salt Lake City, Utah, plans ornamental lighting system.

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NEW ENGLAND

—ELECTRICAL EQUIPMENT ORDERS *are spotty. Negotiations for industrial equipment maintain a good level. Some specialties, such as interior lighting equipment, floodlight units, electric welding, equipment and domestic appliances are moving in good volume.*

During the past week the general trend in electrical equipment sales was somewhat spotty. Industrial equipment orders were fairly steady, with small motor sales reaching over $30,000. Among motor orders were recorded several for 50 hp.; in addition fractional-horsepower motors are receiving some attention from manufacturers and an encouraging trend is reported. Central-station supplies are quiet. Outstanding in this classification are orders for insulators which are being received in good volume, for line extensions in northern New England. Orders for transformers slackened off temporarily. House meter sales for the first quarter showed an encouraging volume as compared with last year. Negotiations for heavy equipment in this district consist of plans for the installation of several turbo-generators, orders for which are expected to be closed soon. Railroad companies recently have become more active in the electrical market. Improved station lighting on a large scale is being planned. An expenditure of over $450,000 is planned for an installation of electric signaling on northern New England division. Playground improvement is active in eastern Massachusetts. Inquiries for spotlights and floodlights have been reported recently. An increase in the demand for electrically controlled traffic signal equipment has resulted in the placement of several orders for this apparatus. Several units of electric arc welders were recently ordered for use on a new all-welded utility building in Boston.

CONSTRUCTION PROJECTS

Edison Electric Illuminating Company, Boston, Mass., has filed plans for a switching station to cost about $45,000. Cambridge Electric Light Company, Cambridge, Mass., has filed plans for extensions and improvements in power plant on Western Avenue.

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EASTERN

—THE CLOSE OF THE MONTH *shows electrical equipment giving signs of easing demand in the new market. The volume of small orders is holding up well, but larger commitments are growing scarce.*

—CENTRAL-STATION *purchases have fallen off during the past week and inquiries do not indicate immediate revival. Industrial sales are scattered and a sizable number of anticipated orders on which quotations have been made are being temporarily held up, with inquiries, in the meantime, lagging.*

Central station demand is centered in substation and affiliated apparatus with the exception of a few pending orders which have now matured. A metropolitan power company has placed a contract with a New York manufacturer for transformers and auxiliary equipment totaling $145,000. A utility company in central New York has ordered a quantity of circuit breakers costing $65,000. The General Electric Company has secured a contract from the Navy Department for a turbo-alternator and accessories for the naval powder factory at Indian Head, Md., at a price of $79,443. The Westinghouse Electric & Manufacturing Company has received an award for equipment for a large municipal pumping station at Detroit, Mich., including three 300-kw. and three 50-kw. motor-generator sets, 160 steel switchboard panels, switchgear, control equipment and auxiliaries.

Electric railway account continues to hold up well and some sizable contracts are looked for from that quarter at an early date. The Bethlehem Steel Corporation has secured an order from the Reading Company for 70 multiple-unit electric cars for use on its electrified lines in the Philadelphia district, and for which a heavy volume of electrical equipment orders recently were placed. Marine account holds promising.

A manufacturer of switches and controls reports orders from iron and steel companies on a satisfactory level; commitments from other branches of industry, however, are on a reduced basis, and immediate inquiries do not give much promise. A maker of generators, motors and control apparatus says that business is slow, and not up to the average of this period last year; current commitments are spotty. A transformer manufacturer in New Jersey is recording a good volume of orders for industrial account.

CONSTRUCTION PROJECTS

William Prym Company of America, Inc., New York, plans metal products plant at New Brunswick, N. J., to cost over $450,000. McKesson & Robbins Company, New York, plans drug plant at Yonkers, N. Y., to cost $140,000. Thomas & Betts Company, New York, plans electric fittings manufacturing plant at Elizabeth, N. J., to cost over $100,000. Erie Railroad Company, New York, will make improvements in yards and terminal at Hornell, N. Y., to cost $200,000. Sheffield Farms Company, New York, plans extensions and improvements in dairy and milk plants to cost about $3,000,000. General Electric Company, Schenectady, N. Y., will build an addition to factory at Bloomfield, N. J., for motor winding service. Philadelphia Electric Company, Philadelphia, Pa., has plans for a power substation to cost $125,000. General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until May 1 for an electric welding machine and other equipment (Panama Schedule 2551) and until May 10 for electric motors, fans, cables, wires, etc. (Panama Schedule 2553). Chief of Engineers, United States Army, Washington, D. C., will receive bids until May 1 for a portable air compressor (Circular 21.)

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SOUTHWEST

—THE SITUATION IN *the St. Louis district has not changed much since last week. There has been a steady volume of sales of small-sized motors, meters, transformers and construction materials.*

There are still many estimates being prepared which will bring future orders, and all interviewed say that the future in the electrical industry looks very bright. Two contracts were closed for load ratio control transformers for a power plant, the total of both orders amounting to $39,000.

CONSTRUCTION PROJECTS

Armour & Company, Kansas City, Kan., plans addition to butterine plant to cost $160,000. West Texas Utilities Company, Abilene, Tex., contemplates construction of steam-operated electric power plant on Lytle Creek with capacity of 20,000 kw. Southwestern Public Service Company, Amarillo, Tex., is expanding local steam-operated electric power plant to develop a capacity of 22,500 kw.

New Equipment Available

Device for Safe Removal of Industrial Units

THE "SAFECHANGE" HANGER, a device which permits the easy and safe removal of industrial units for cleaning or relamping, is announced by the

Westinghouse Electric & Manufacturing Company. When the "Safechange" hanger is used the unit cannot be removed or replaced while it is connected to the line. The arrangement prevents the hook from being engaged or disengaged while the plug is in place. Therefore, the maintenance man cannot remove or replace a unit without first disconnecting it from the line.

The "Safechange" hanger is extremely simple in construction. It insures safety in maintenance of lighting units and it enables the interchange of large and small lighting units by merely removing the plug and unhooking the unit.

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Differential Type Megohmer

A PRODUCT KNOWN AS the "Paragon megohmer," which is of the differential type, with three coils, one series coil, one shunt coil and one compensating coil, has been announced by Herman H. Sticht & Company, 15 Park Row, New York. It is a Siemens & Halske product. Due to the use of powerful magnets the coils are shorter and mounted symmetrically on the shaft.

The whole measuring system, complete with magnet, is mounted in a special dust- and fume-proof light-weight alloy housing. The protective and shunt resistances, totaling over 800,000 ohms, are wound on porcelain spools and mounted under this housing, which is readily removable from the instrument case.

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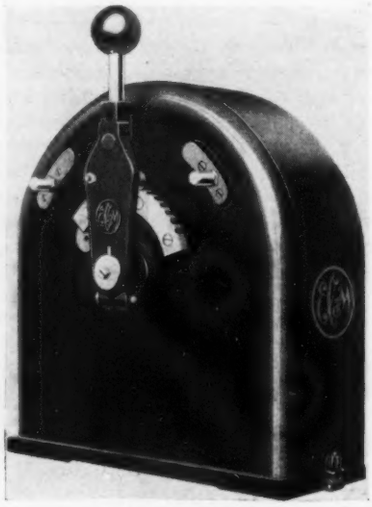
Master Switch Provides Complete Speed Control

A MASTER SWITCH THE FUNCTION of which is to regulate the control circuits of a magnetic contactor controller and is intended for use on cranes, hoists, ore bridges, steel mill machinery and other applications where full speed control from the master switch is desired has been announced by the Electric Controller & Manufacturing Company, Cleveland, Ohio.

Particular attention has been given to make the width of this master switch as small as possible, so that when several of these switches are mounted in a crane cage or operator's pulpit the operator, without changing his position, can conveniently reach and operate them.

The type NT master switches are built to give a maximum of six points of speed control in each direction with



overload reset at the "off" position. Master switches for 4, 5 or 6 points of speed control are identical, the only difference being the location of the arm stops. Since these stops are merely screwed into the main frame, they can be readily changed in the field to provide any one of these number of points of speed control, thereby reducing the spare part problem.

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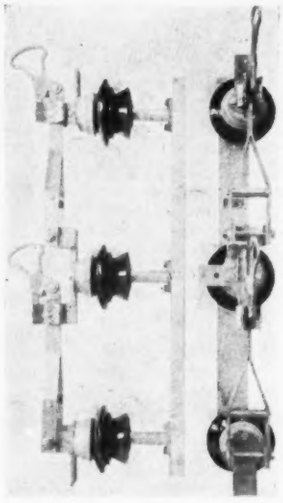
Double Blade Transfer Type Switch

A LINE OF DOUBLE-BLADE, double-throw transfer type disconnecting switches has been developed by the Champion Switch Company, Kenova, W. Va. These



switches are furnished with double self-aligning, full-floating contacts, truss type blades, positive lock, blade pry and a large eye for the operating stick.

The switch shown is rated at 15,000 volts, 600 amp., but it can be supplied for various voltage and ampere ratings and with any of the standard makes of insulators.

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A SPECIAL CABLE to meet the unusual requirements of neon signs is announced by the General Electric Company. It has a maximum over-all diameter of ½ in. In addition to its use with neon signs the new cable is applicable wherever a small-diameter, corona-proof, high-voltage conductor is required. In a recent puncture test a sample of the cable was raised to 50,000 volts and held for one minute. In the extended voltage test, where a coiled sample must withstand 30,000 volts between conductor and mandrel for one hour, the sample was held 120 hours, and the voltage was then raised until failure occurred at 68,000 volts. In the moisture absorption test a sample immersed for 24 hours absorbed only 0.56 per cent by weight, whereas the permissible absorption is 10 per cent.